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ABSTRACT

This book is designed to supplement The University of Chicago School Mathematics Project's (UCSMP) Transition Mathematics textbook. The content and questions in this book have been sequenced to specific geometry lessons in the Transition Mathematics text. All geometry explorations are done with the TI-92 calculator. This book is organized around 15 lessons that can be completed in a 60-minute mathematics class. Problems assigned at the end of the lessons are similar to the problems in the parent textbook. (ASK)

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Seventh Grade Geometry Unit
New Albany-Floyd County School Corporation
TI-92 Supplementary Activities
Teacher Edition

ED 428 951

by Walter F. Ryan, Ph.D.

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Preface

This book is designed to supplement The University of Chicago School Mathematics Project Transition Mathematics. The content and questions in this book have been carefully sequenced to specific geometry lessons in the Transitions Mathematics text. All references are to specific sections and page numbers in the Transition Mathematics text.

The instructional format in this supplemental book is designed to maximize student exploration of geometry concepts in a group setting. All geometry explorations are completed with the TI-92 calculator. This book is organized around lessons that can be completed in a 60 minute mathematics class. Problems assigned at the end of the lessons in this supplemental unit are similar to the problems at the end of the lessons in the Transition Mathematics textbook. Students should use the TI-92 calculator to complete these problems.

Other students will be using this supplemental text. Therefore, students are not to write or make marks on any pages in this supplemental text. The classroom teacher will give students copies of all necessary recording sheets when they need them. The classroom teacher will coordinate the distribution and return of this supplemental unit.

Lesson 1
Introduction to TI-92 Calculator

Welcome to geometry explorations as experienced on the TI-92 calculator. During the next six to eight weeks you will be exploring geometry concepts with the help of the TI-92 calculator. You will be assigned a specific calculator to work with during this time. It is important that you use the same calculator each day. So follow your teacher's instructions to receive your calculator. Students in other classes will also be using this calculator, so be very careful with it.

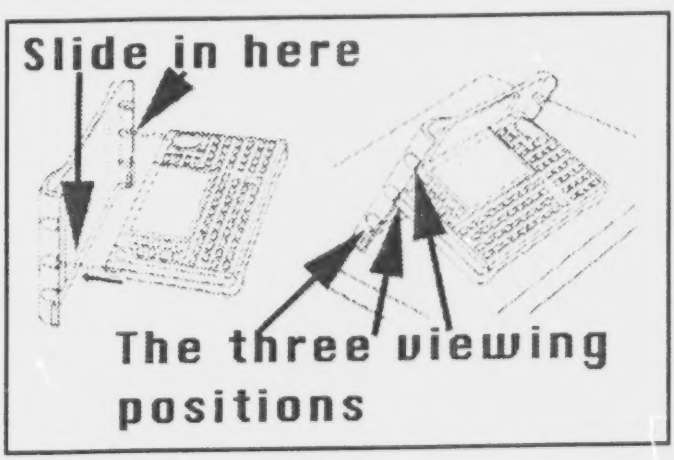
This lesson will explain to you some essential features that you need to understand about the operation of the TI-92 calculator. Your teacher will explain these features to you in class. If later you forget how to complete a particular function on the calculator, you can review that function either by finding the explanation in the specific lesson or by reading the more general explanation given in the reference section at the end of these lessons.

Before you begin to use the calculator, it would be helpful if you learned how to angle the calculator to better view the screen. Read the following section and follow the instructions to learn how to set up your calculator for better viewing.

Part 1 - Familiarization with TI-92 Calculator

Using the Snap-On Cover as a Stand

To make it easier to see the screen on the TI-92 calculator you can use the snap-on cover to angle the screen. To do this, slide the tabs on the top sides of the calculator into the slots in the cover.



There are three different slots on the cover. These give you three different viewing angles. Experiment with the different viewing angles and find the angle that gives you the best view of the screen.

You are now ready to turn on your calculator. The teacher will explain how to do this. The following section outlines this procedure.

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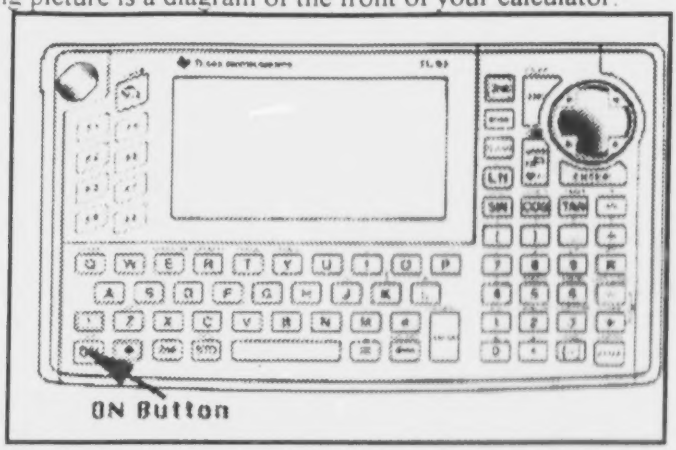
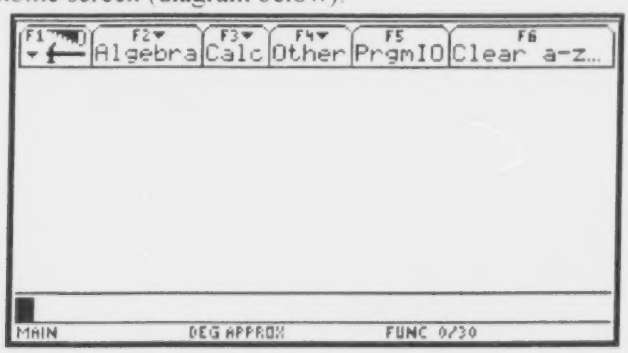
Turning on the TI-92 Calculator

The following picture is a diagram of the front of your calculator:



The **ON** button is in the bottom left hand corner of your calculator. Press this button and you should get the home screen (diagram below).

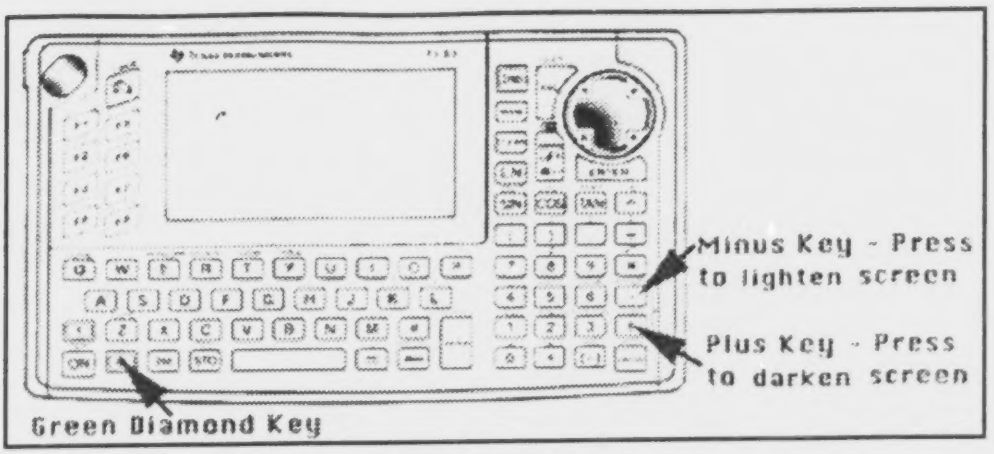


If you cannot see anything on the screen of your calculator, you will need to adjust the screen display. Your teacher will explain this process to you. The next section explains how to adjust the screen display.

Adjusting Screen Display

Sometimes when you turn the calculator on it is difficult to see the screen (you may not be able to see anything). At any time or in any application you can darken or lighten the screen display to make it easier to see the screen. To adjust the screen display, complete the following steps:

1. Press and hold down the **green diamond [◆]** key (second key to the right from bottom left hand corner).
2. Press the **plus [+]** key (second key up from bottom right hand corner) to darken the screen display or press the **minus [-]** key (third key up from bottom left hand corner) to lighten the screen display.

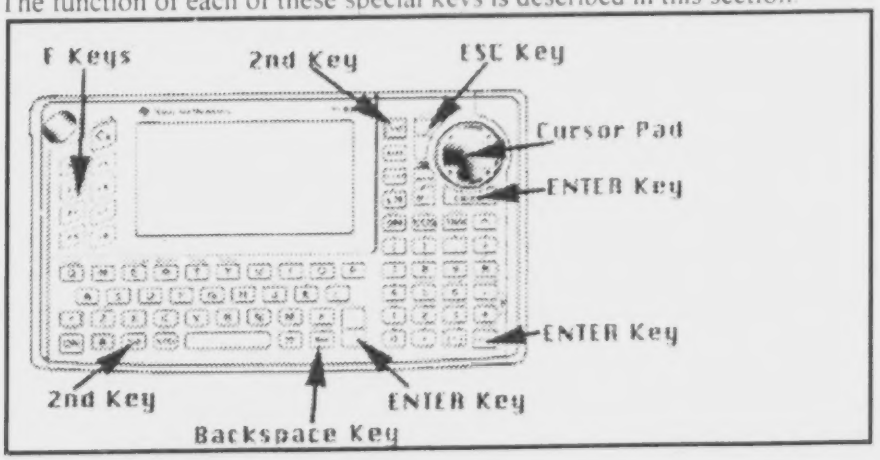


If you press the **green diamond [◆]** key but do not hold it down, then pressing the **plus [+]** key or the **minus [-]** key will not lighten or darken the screen. It is important *to press and hold down* **the green diamond [◆]** key when trying to adjust the screen display. Follow these instructions until the screen display is clear.

Now that you can see your calculator screen, your teacher will explain to you the functions of some essential keys on the TI-92 calculator. Below is a summary of these keys.

Special Keys

The diagram below shows the position of many of the special keys on the TI-92 calculator. The function of each of these special keys is described in this section.



Cursor Pad

The cursor pad is the large blue button in the top right hand corner of your calculator. By pressing the cursor pad, you can move around the screen. For example, by pressing on the left hand side of the cursor pad the screen cursor moves to the left.

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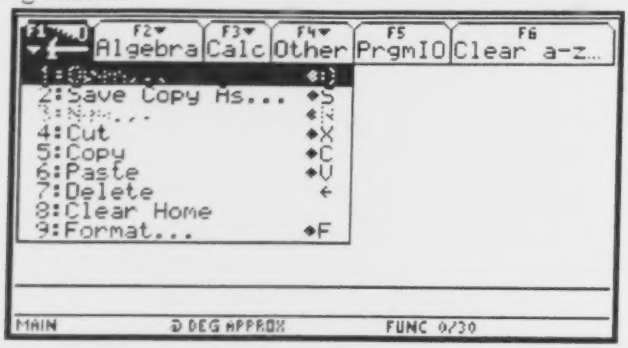
F Keys

The **F (Function)** keys are on the left hand side of your screen. These F keys give you access to the functions listed when you press them. For example, on the home screen, if you press **F1** you get the following choices:



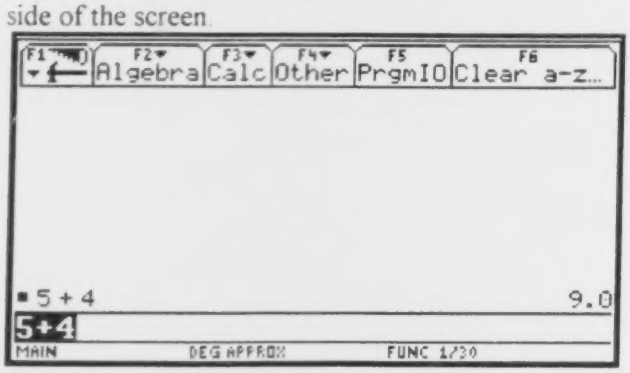
You can use the cursor pad to move down and up through the different choices. When the choice you wish to use is highlighted you press an **ENTER** key. If after pressing an **F** key you decide you do not wish to do any of the functions listed, then press the **ESC** key.

ESC Key

The **ESC** key is located next to the cursor pad. It is used to cancel any function listing or dialog box.

ENTER Keys

There are three **ENTER** keys on the TI-92 calculator. All **ENTER** keys perform the same functions. Pressing an **ENTER** key executes the last instruction that you gave the calculator. For example, if you type the number 5, followed by +, then 4 **[5 + 4]**, and then pressed an **ENTER** key, the TI-92 calculator will add 5 and 4 and give you the answer 9.0. Notice the manner in which the TI-92 calculator displays this. The expression is on the left side of the screen and the answer is on the right side of the screen.



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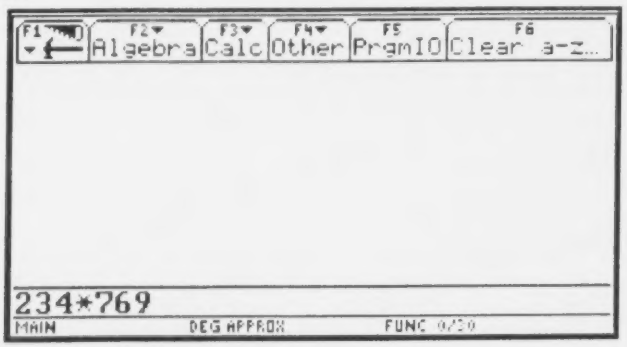
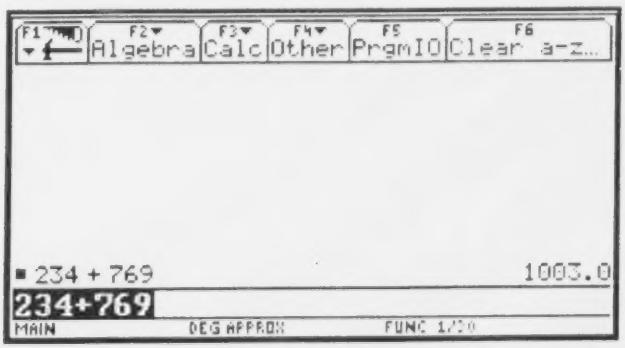
Backspace Key [←]

The backspace key [←] is located on the bottom row next to the **ENTER** key. If you make a mistake in entering numbers, operations, symbols, or letters into the calculator, you can use the backspace key [←] to delete the mistakes. To delete your mistake, make sure your screen cursor is at the end of the operation. Press your backspace key [←] several times to delete all entries until you delete your mistake. Now you need to retype all deleted entries so that you have the correct entries. Type the expression, **234 X 769**, into your calculator. Your screen should now be like the following one:



Let us say that instead of multiplying 234 and 769 we want to add 234 and 769. First we will use the cursor pad to make sure the screen cursor is located after the number 9. Pressing the backspace key [←] four times deletes all entries back to the 4 in 234. Now we need to type in +234. Pressing an **ENTER** key tells the TI-92 to complete the addition, and we see the following on the screen.



2nd Keys

There are two **2nd** keys on your calculator. One of these keys is located next to the **ESC** key. The other is located next to the **green diamond [◆]** key. Pressing one of the **2nd** keys lets you access the second function of the next key you press. The **2nd** function of the keys is the yellow symbol above the key. For example, pressing the **2nd** key and then the multiplication key **[×]** actually gets you the square root **[√]** symbol.

Now that you have completed several problems on your calculator, it is time to learn how to turn your calculator off. Before turning off the calculator be sure to clear the home screen. To

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clear the home screen press **F1** and use the cursor pad to scroll down to highlight **8: Clear Home**. Press an **ENTER** key. You should always clear the home screen before turning off the calculator. In this way, when you or another student turns on the calculator the home screen will always be clear.

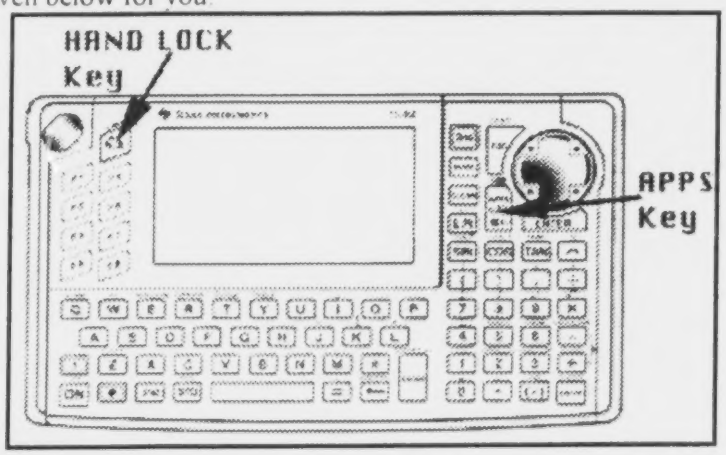
Turning Off the TI-92 Calculator

To turn off the TI-92 calculator, press the **2nd** key and then the **ON** key.

Part 2 - Introduction to Geometry Applications

Turn on your calculator (refer to page 2). Your teacher is going to explain to you how to get to the geometry application. While in the geometry application you will get a chance to explore some of the different figures and diagrams that the TI-92 calculator can draw.

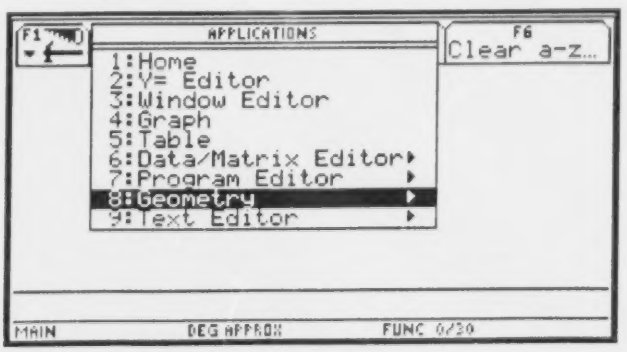
To get to the geometry application follow the teacher's instructions carefully. These instructions are given below for you.



Starting a New Geometry Session

To start a new geometry session, complete the following steps:

1. Press the **APPS** key (just to the left of the cursor pad).
2. Choose **8: Geometry** by using the cursor pad to scroll down to highlight this option. You should get the following screen:



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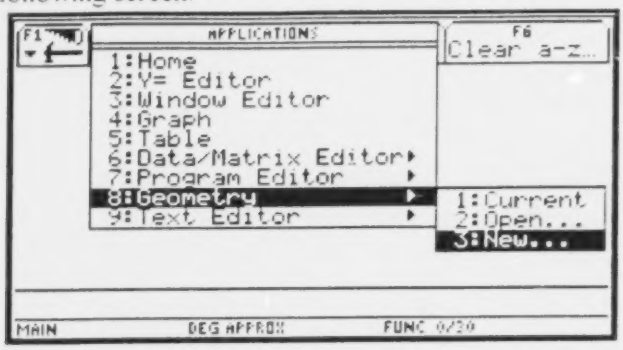
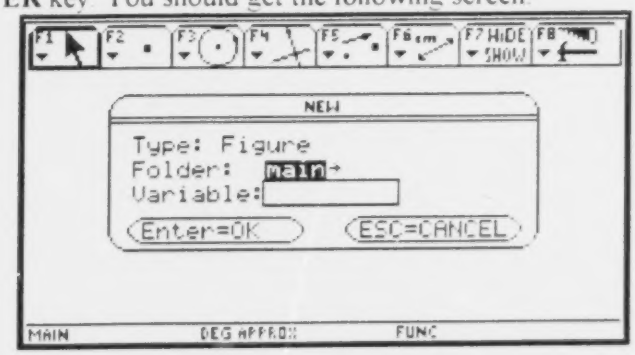
If you chose the wrong application (application other than geometry), then you will not get this screen. In this case you need to press the **APPS** key again.

3 Press an **ENTER** key.

4 Choose option **3: New** by using the cursor pad to scroll down to highlight this option. You should get the following screen.



5 Press an **ENTER** key. You should get the following screen.



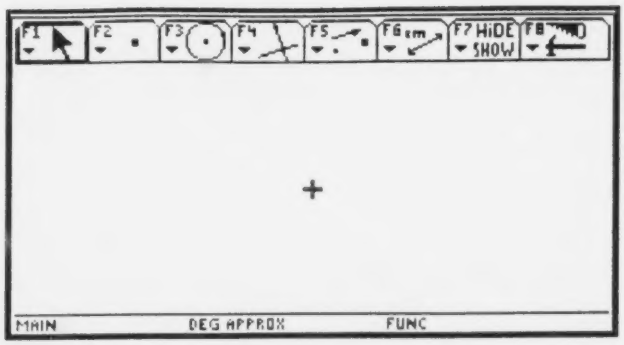
Note the **New** at the top of the dialog box. If the top of your dialog box says **OPEN** you chose the wrong option and you need to press the **APPS** key again and repeat steps 1 to 5. If you did not get a dialog box, then you need to press the **APPS** key again and repeat steps 2 to 5.

6 The word "**main**" to the right of the word "**Folder:**" should be blinking. Press on the bottom part of your cursor pad. The screen cursor should now be blinking in the dialog box to the right of the word "**Variable:**"

7 Your teacher will tell you the word to type. Type this word into the dialog box.

8 Press an **ENTER** key. Nothing appears to happen. This first pressing of the **ENTER** key tells the calculator that this is the name that you wish to use for this geometry calculator session.

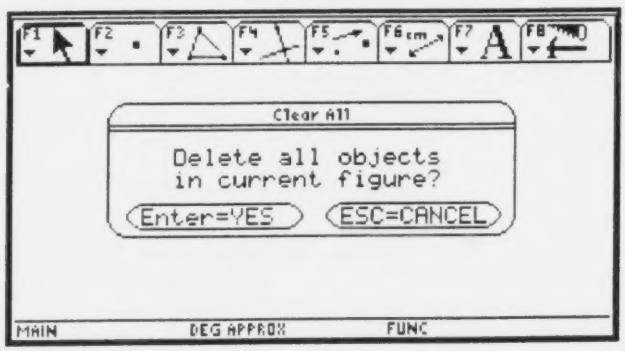
9 Press an **ENTER** key a second time. You should now get the following geometry screen. If you do not get this screen, tell your teacher.



Your teacher will now explain to you how to draw, drag, and resize several geometry figures. After completing each drawing you will need to clear the geometry screen of the TI-92 calculator. The following section outlines this procedure for you.

Clearing Geometry Screen

Sometimes after completing a geometry drawing we want to clear the screen before completing a new geometry drawing. To clear the screen press **F8** and use the cursor pad to highlight **8: Clear All**. Then press an **ENTER** key. When you do this you will get the following screen.

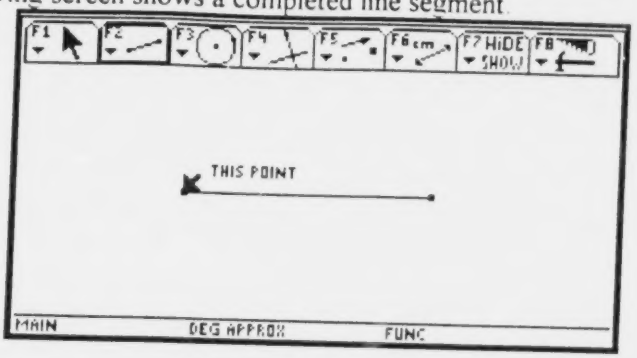


This gives you a second chance to change your mind. If you want to clear the screen, you press an **ENTER** key when you see this screen. It is important to note that this procedure deletes the geometry drawing. If you change your mind and decide you do not want to clear the screen, you press the **ESC** key when you see this screen.

Drawing a Line Segment

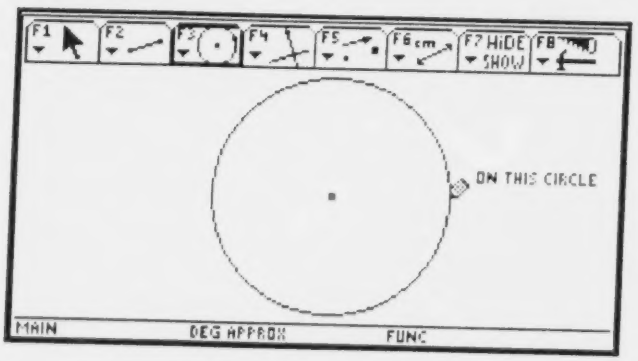
To draw a line segment you need to define the two endpoints of the line segment. Start by pressing **F2**. Use the cursor pad to scroll down and highlight **5: Segment**. Press an **ENTER** key. You should now see the drawing pencil [✎] on the screen. The screen cursor will always be in the shape of a pencil when your calculator is in the drawing mode. Position the pencil at the position on the screen where you wish to place the first endpoint of the line segment. Press an **ENTER** key. The first endpoint should be blinking on the screen. Use the cursor to move the pencil to the position on the screen where you wish to place the second endpoint of the line segment. Press an

ENTER key. Your line segment is now defined. You should see the words **"THIS POINT"** on the screen. The following screen shows a completed line segment.



Drawing a Circle

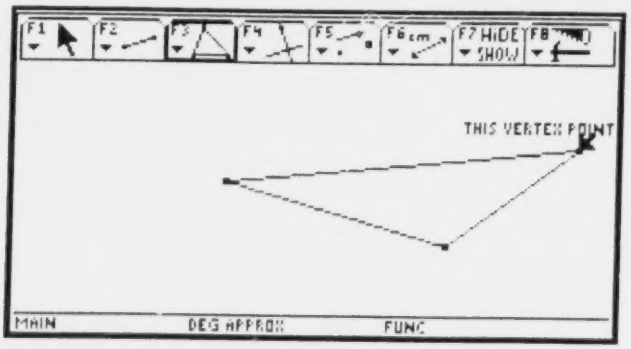
To draw a circle you need to define the center of the circle and then the size of the circle (radius). Start by pressing **F3**. Use the cursor pad to highlight **1: Circle**. Press an **ENTER** key. You should now see the drawing pencil [✎] on the screen. Position the pencil on the screen where you wish to place the center of the circle. Press an **ENTER** key. The center point of the circle should be blinking on the screen. Use the cursor to move the pencil away from the center point of the circle. When the circle is the right size, press an **ENTER** key. Your circle is now defined. You should see the words **"ON THIS CIRCLE"** on the screen. The following screen shows a completed circle.



Drawing a Triangle

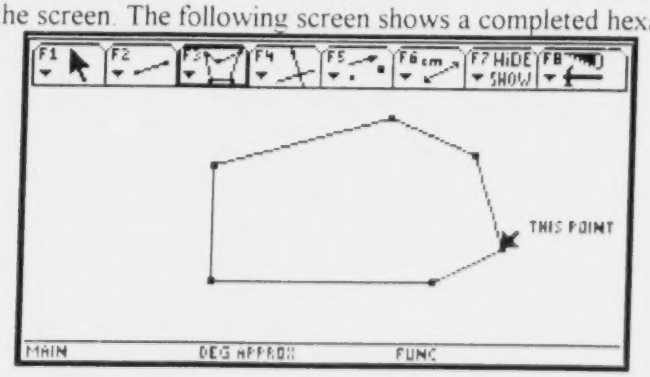
To draw a triangle you need to define the three vertices of the triangle. Start by pressing **F3**. Use the cursor pad to highlight **3: Triangle**. Press an **ENTER** key. You should now see the drawing pencil [✎] on the screen. Position the pencil on the screen where you wish to place the first vertex of the triangle. Press an **ENTER** key. The first vertex point of the triangle should be blinking on the screen. Use the cursor to move the pencil away from the first vertex point of the triangle. When the pencil is positioned at the right place on the screen for the second vertex point press an **ENTER** key. Your second vertex point for the triangle has now been defined. The first side of the triangle should be a dotted line. Use the cursor to move the pencil away from the second vertex point of the triangle. When the pencil is positioned at the right place on the screen

for the third vertex point, press an **ENTER** key. Your triangle has now been defined. You should see the words "**THIS VERTEX POINT**" on the screen. The following screen shows a completed triangle.



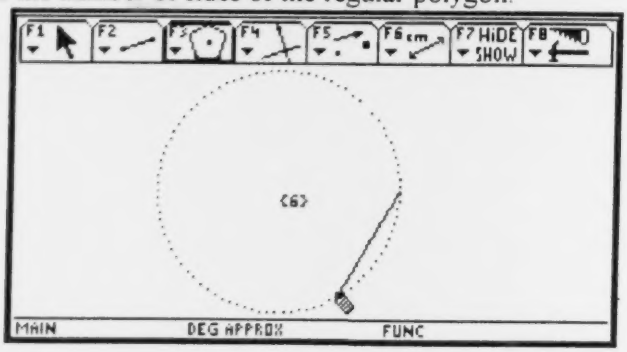
Drawing a Polygon

To draw a polygon you need to define the vertices of the polygon. Start by pressing **F3**. Use the cursor pad to highlight **4: Polygon**. Press an **ENTER** key. You should now see the drawing pencil [✎] on the screen. We need to decide the number of sides of the polygon that we wish to draw. For this description we are going to draw a polygon with six sides (hexagon). Position the pencil on the screen where you wish to place the first vertex of the hexagon. Press an **ENTER** key. The first vertex point of the hexagon should be blinking on the screen. Use the cursor to move the pencil away from the first vertex point of the hexagon. When the pencil is positioned at the right place on the screen for the second vertex point, press an **ENTER** key. Your second vertex point for the hexagon has now been defined. The first side of the hexagon should be a dotted line. Use the cursor to move the pencil away from the second vertex point of the hexagon. When the pencil is positioned at the right place on the screen for the third vertex point, press an **ENTER** key. Repeat this procedure to define vertex 4, vertex 5, and vertex 6. You now have defined the six vertices of the hexagon. However, the calculator does not know that you want to draw a hexagon. To tell the calculator that the sixth vertex is the last vertex, you need to press an **ENTER** key a second time. Your hexagon has now been defined. You should see the words "**THIS POINT**" on the screen. The following screen shows a completed hexagon.

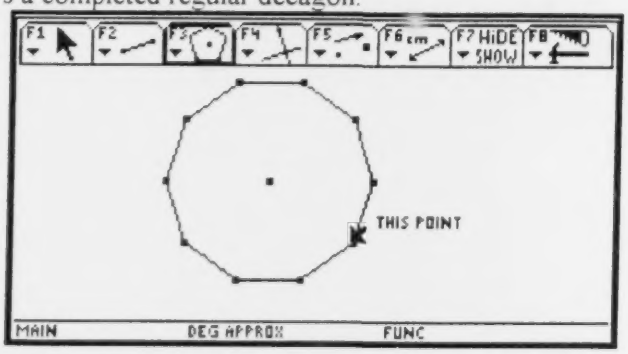


Drawing a Regular Polygon

To draw a regular polygon you need to define the number of sides. A regular polygon has sides of the same length and angles of the same measure. Start by pressing **F3**. Use the cursor pad to highlight **5: Regular Polygon**. Press an **ENTER** key. You should now see the drawing pencil [✎] on the screen. Position the pencil in the middle of the screen. Press an **ENTER** key. You should see a blinking point on the screen. Use the cursor pad to move the screen cursor away from this point. You should see a dotted circle on the screen. Move the cursor until the dotted circle is a reasonable size. Press an **ENTER** key. You should see a number by the center point of the circle. This number represents the number of sides of the regular polygon.



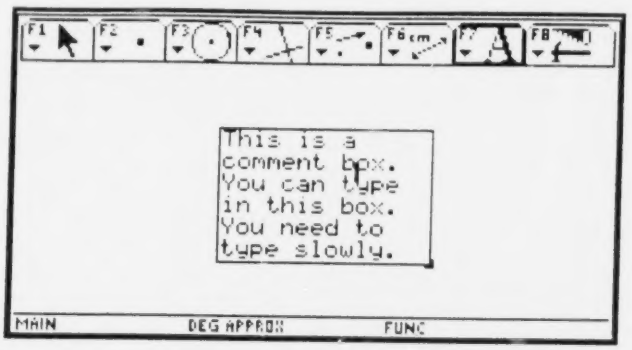
In the diagram above, the calculator indicates that it will draw a six sided regular polygon. Use the cursor pad to move the screen cursor until you get the number 10 by the center point of the circle. Press an **ENTER** key. The TI-92 calculator draws a regular decagon (10 sides). The following screen shows a completed regular decagon.



Comment Box

Sometimes you would like to add some comments on your drawings. You can do this by using the **Comment Box**. Press **F7**. Use the cursor pad to scroll down and highlight **5: Comment**. Press an **ENTER** key. Use the cursor pad to position the screen cursor [✥] at the point where you would like to make a comment. Press an **ENTER** key. You get a comment dialog box. You type your comments in this box. You can make the **Comment Box** wider by using the **HAND LOCK** key and the cursor pad and dragging the bottom right hand corner of the box. You need to type slowly in the **Comment Box**. If you type too fast the calculator will miss some of your letters.

When you are finished typing your comments, press the **ESC** key. Below is a sample of a comment box.

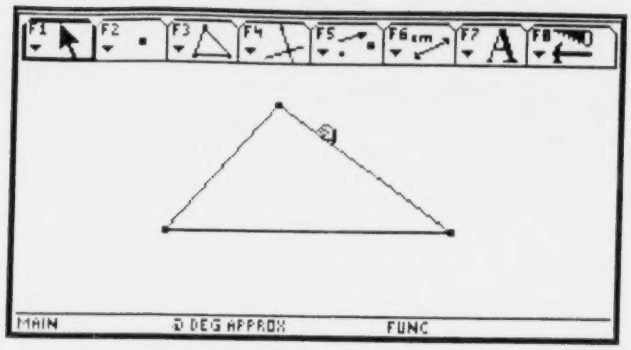


Dragging Geometric Figures and Text

To drag a geometric figure or comment box text you need to choose the pointer tool. To get the pointer tool, press **F1**. Use the cursor pad to highlight **1: Pointer**. Press an **ENTER** key. Now use your cursor pad to move your screen cursor [✚] to the geometric figure or comment box text that you wish to drag.

- For line segment, move the screen cursor [✚] to the line segment until you see "**THIS SEGMENT**" on the screen.
- For circle, move the screen cursor [✚] to the center point of the circle until you see "**THIS POINT**" on the screen.
- For triangle, move the screen cursor [✚] to the triangle until you see "**THIS TRIANGLE**" on the screen.
- For polygon, move the screen cursor [✚] to the polygon until you see "**THIS POLYGON**" on the screen.
- For regular polygon, move the screen cursor [✚] to the regular polygon until you see "**THIS REGULAR POLYGON**" on the screen.
- For comment box, move the screen cursor [✚] to the comment box text until you see "**THIS TEXT**" on the screen.

To drag the geometric figure or comment box text, *press and hold down* the **HAND LOCK** key (key above the F5 key). The screen cursor should change to the shape of a hand. Use the cursor pad to drag the figure or comment box text to a new position on the screen. The following figure shows a triangle being dragged to a new position on the screen. Notice that the drag hand is touching a side of the triangle and not one of the vertices.

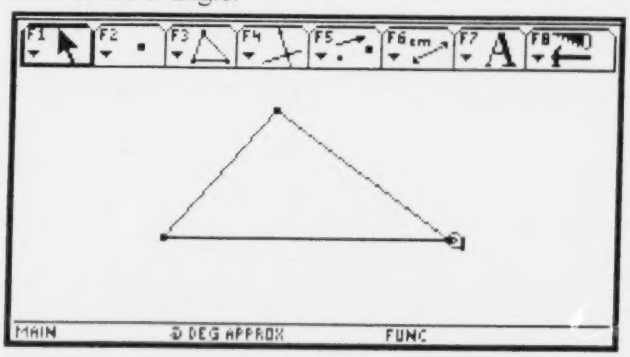


Resizing Geometric Figures

To resize (make smaller or larger) a geometric figure, you need to choose the pointer tool. To get the pointer tool, press **F1**. Use the cursor pad to highlight **1: Pointer**. Press an **ENTER** key.

- For triangle, polygon, and regular polygon, use the cursor pad to move the screen cursor [✚] to one of the vertices of the figure. You should see "**THIS POINT**" on the screen.
- For line segment, use the cursor pad to move the screen cursor to one of the endpoints of the line segment. You should see "**THIS POINT**" on the screen.
- For circle, use the cursor pad to move the screen cursor [✚] to the circle. You should see "**THIS CIRCLE**" on the screen.

To resize the geometric figure, *press and hold down* the **HAND LOCK** key (key above the F5 key). The screen cursor should change to the shape of a hand. Use the cursor pad to drag the vertex of the triangle, polygon, or regular polygon, the endpoint of the line segment, or the circle. The following diagram shows a triangle being enlarged. Notice that the drag hand is touching one of the vertices of the triangle.



Your teacher will give you time for some free exploration in the geometry application of the TI-92 calculator. You can draw any geometric design of your choice. On pages 15 and 16 there are some designs made by other seventh grade students using the TI-92 calculator. Have fun.

When drawing your geometric design you may make a mistake in one part of the design. The following section outlines the procedure for deleting one part of a geometry drawing.

Deletion of One Part of a Geometry Drawing

1. Draw a circle on the geometry screen.
2. On a different part of the calculator screen, draw a triangle.
3. You will now delete the circle. To do this you need to press **F1**.
4. Use your cursor pad to highlight **1: Pointer**
5. Press an **ENTER** key.
6. Use the cursor pad to move the screen cursor to the circle. You should see the words "**THIS CIRCLE**" on the screen.
7. Press an **ENTER** key. The Circle should become dotted.
8. Press **F8**.
9. Use your cursor pad to highlight **7: Delete**.
10. Press an **ENTER** key. The circle is deleted. Notice that the center point for the circle is not deleted. You can repeat steps 4 to 10 to delete the center point of the circle.
11. If you accidentally deleted a part of your geometry drawing, then press **F8** and use your cursor pad to highlight **D: Undo**. Press an **ENTER** key and the part of the drawing that was deleted will return. This procedure must be completed immediately after you have accidentally deleted the part of your geometry drawing.

When you are finished with your designs, you need to return to the home screen before turning off the calculator. The following section describes how to get to the home screen.

Getting the Home Screen

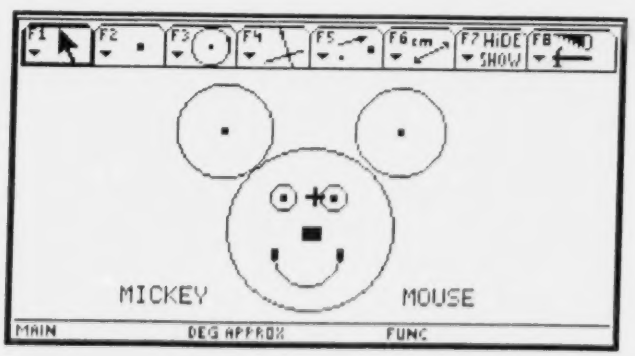
To get to the home screen from your geometry screen complete the following steps.

1. Press the **green diamond [◆]** key.
2. Press the **Q** key.
3. You should now be back at the home screen.

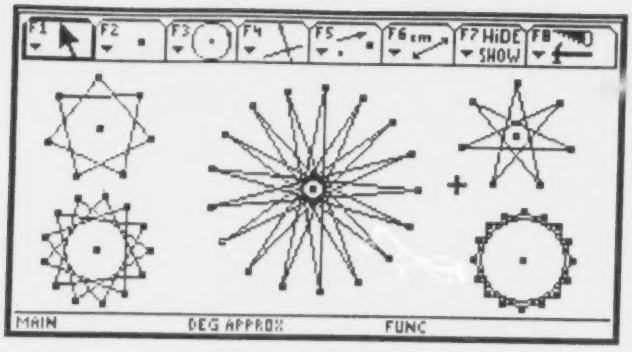
Some Geometry Designs

The following designs were drawn by seventh grade students.

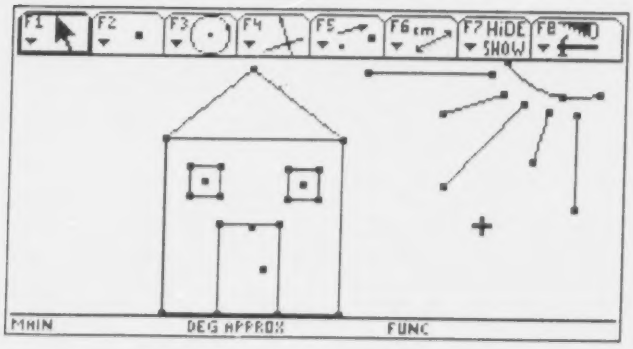
Design 1



Design 2



Design 3



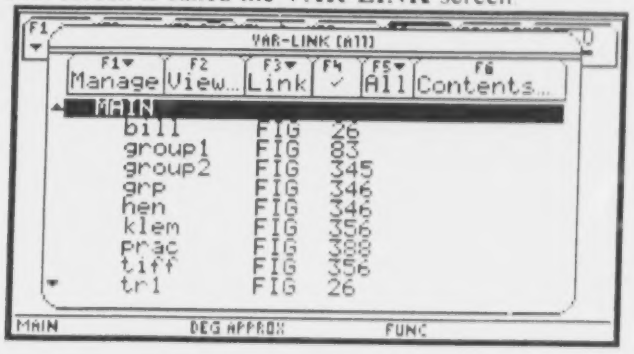
Lesson 2
File Management, and Labeling and Measuring Geometric Figures

As mentioned in the first lesson, many other students will be using the same calculator as you. Therefore, you need some way to keep your work on the TI-92 calculator separate from the other students' work. To do this, your teacher will explain to you how you can create a folder in which to keep your work. These instructions are outlined briefly below.

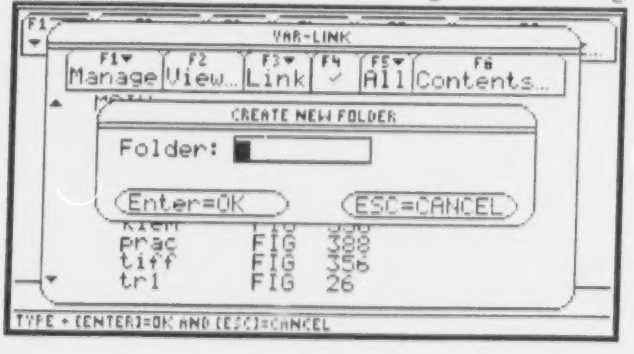
Part 1 - File Management

Creating a New Folder for Your Work

1. Turn on your calculator (refer to page 3). If necessary, adjust the screen display (refer to page 3).
2. Press one of the 2^{nd} keys.
3. Press the **minus [−]** key. You should now see a screen like the one below. If not, repeat steps 2 and 3. This screen is called the **VAR-LINK** screen.



4. Press **F1**.
5. Choose **5: Create Folder** by using the cursor pad to scroll down to highlight this option and then pressing an **ENTER** key. You should now get the following screen.



6. Your teacher will tell you a name to type in the dialog box to the right of the word **Folder:** If you make a mistake, use the backspace key [←] to delete all entries back as far as your mistake. Retype all deleted entries.
7. Press an **ENTER** key. Nothing appears to happen. Pressing the enter key the first time just tells the calculator that the name that you typed is the name for the new folder.

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8 Press an **ENTER** key again.

9 Your new folder should now appear on the screen. Folders are listed on the screen in alphabetical order and in uppercase (capital) letters. You may have to use the cursor pad to scroll down the screen to find your folder.

10 If you have spelled your folder name incorrectly, use the cursor pad to highlight the folder and then press **F1**. Choose **3: Rename** by using the cursor pad to scroll down to highlight this option and then pressing an **ENTER** key. Type in the corrected name for your folder. Press an **ENTER** key twice. The corrected name for the folder should now appear on the screen.

11 Press the **ESC** key to return to the home screen.

For all your future work on this calculator, you will use this folder for you work. The TI-92 calculator automatically saves your work when you shut down the calculator. There is never any need to use the save function.

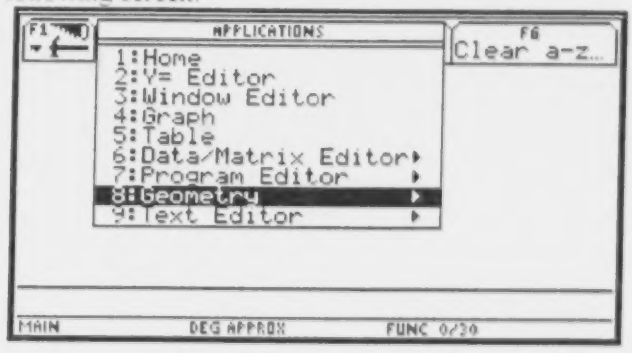
Part 2 - Geometry Applications

Starting a New Geometry Session Using Your New Folder

Your teacher will now explain to you how to start a new geometry session using the new folder that you just created. You will need to remember these instructions since you will start new geometry sessions in your folder frequently during the next six to eight weeks. The instructions for this procedure are outlined below.

1 Press the **APPS** key.

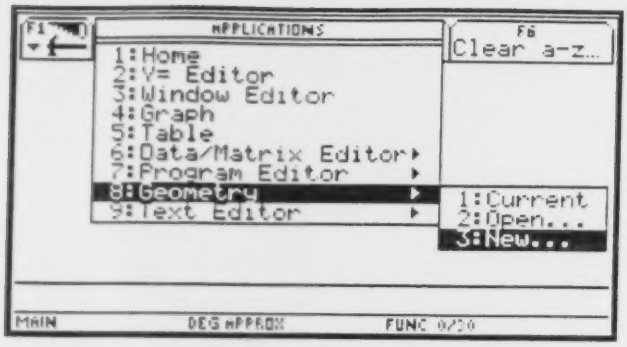
2 Choose **8: Geometry** by using the cursor pad to scroll down to highlight this option. You should get the following screen:



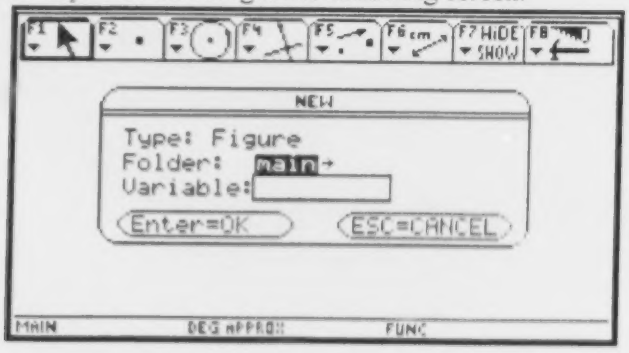
If you chose the wrong application (application other than geometry), press the **APPS** key again to start over.

3 Press an **ENTER** key.

4 Choose **3: New** by using the cursor pad to scroll down to highlight this option. You should get the following screen.

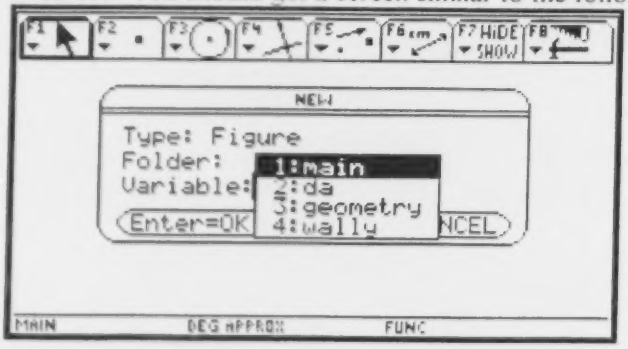


5 Press an **ENTER** key. You should get the following screen:



If you pressed the wrong number, press the **APPS** key again and repeat steps 1 to 5

6 The word "**main**" to the right of the word "**Folder:**" should be blinking. Press on the right hand side of your cursor. You should get a screen similar to the following one:



7 Choose your new folder by using the cursor pad to scroll down and then pressing an **ENTER** key when your folder is highlighted.

8 Your folder's name should now be blinking to the right of the word "**Folder:**" If not, you chose the wrong folder. In this case, repeat step 5 and choose your folder.

9 Press down on the cursor pad. The screen cursor should now be blinking to the right of the word "**Variable:**"

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10 Type in **tri** for this geometry session.

11 Press an **ENTER** key twice.

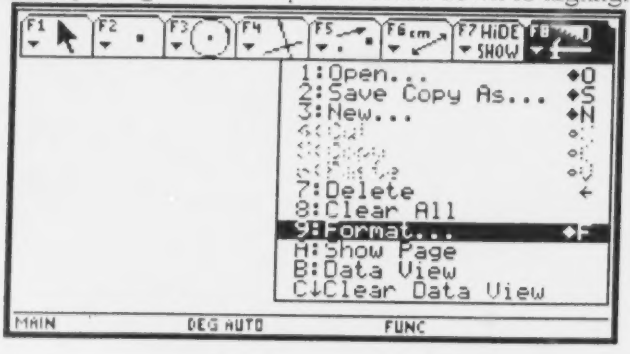
12 You should now get a new blank geometry screen. If you do not get a blank geometry screen, tell your teacher.

Setting the Precision of your TI-92 Calculator Measurements

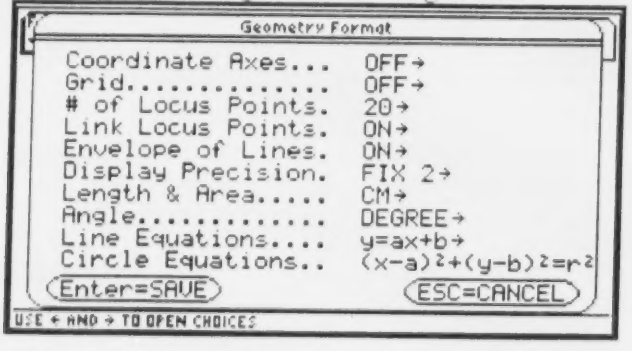
When you start a new geometry session you need to tell the TI-92 calculator the precision (the number of decimal places) of the calculator measurements. Your teacher will explain to you how to set the precision of TI-92 calculator measurements to tenths. You will need to remember these instructions since you will need to set the precision of calculator measurements to tenths at the beginning of each new geometry session.

1 Press the **F8** key.

2 Choose **9: Format** by using the cursor pad to scroll down to highlight this option.



3 Press an **ENTER** key. You should get the following screen.



4 Choose **Display Precision** by using your cursor pad to scroll down and highlight this option. The **FIX 2** should be blinking.

5 Press on the right hand side of the cursor.

6 Listed on this screen are the choices for the calculator geometry measurement precision. For this unit, you will also choose **1: FIX 1**. This will set the precision of all calculator measurements for the geometry session to tenths. Therefore, use your cursor pad to highlight **1: FIX 1**. You should get the following screen.

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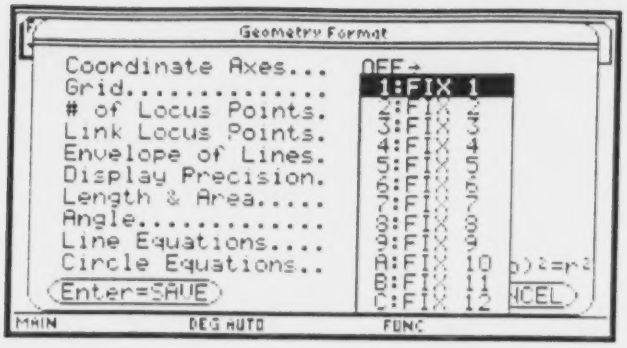
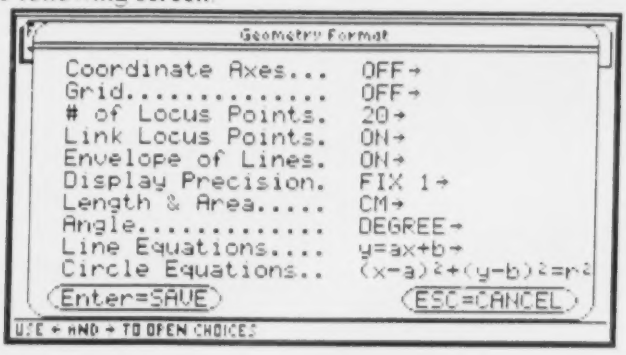


7 Press an **ENTER** key.

8 The **Display Precision** should now be set at **FIX 1**. If the Display Precision is not set at FIX 1 then you will need to repeat steps 5 to 7 to set the Display precision to FIX 1. You should have the following screen:

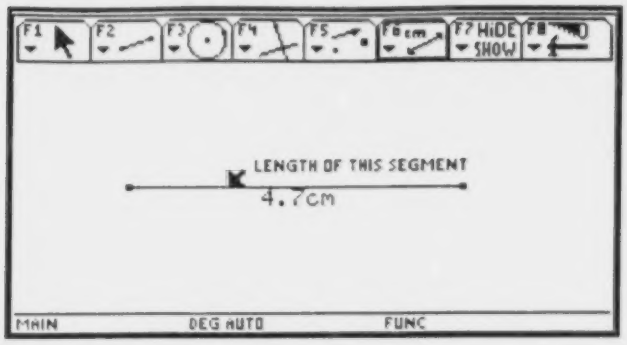


9 Press an **ENTER** Key. You should return to your geometry session.

Drawing and Measuring a Line Segment

For this activity, your teacher will give you a recording table. Use this recording table to write your answers.

After you have set the TI-92 calculator measurement to tenths, use the drawing tool to draw a line segment. If you forgot how to draw a line segment refer to the section, Drawing a Line Segment, on page 9. After you have drawn your line segment, use your ruler to measure to the nearest tenth of a centimeter the length of the line segment. Write your answer in the recording table for Line Segment Measurement that your teacher supplied. Now, you will use the TI-92 calculator to measure the line segment. The measuring tools on the TI-92 are listed under **F6**. Press **F6**. Use the cursor pad to highlight **1: Distance & Length** and press an **ENTER** key. Now, use the cursor pad to move the screen cursor to the line segment. You will see "**LENGTH OF THIS SEGMENT**" on the screen. Press an **ENTER** key and the TI-92 will measure the line segment. Your screen should be similar to the following one.



Write this measurement on the recording table for Line Segment Measurement.

Was there any difference between your ruler measurement of the line segment and the TI-92 calculator measurement of the line segment? If so, why do you think the two measurements are different?

Clear the geometry screen. If you forgot how to clear the geometry screen, refer to section, Clearing Geometry Screen, on page 9. After you have cleared the geometry screen, use the drawing tool to draw a triangle If you forgot how to draw a triangle refer to section, Drawing a Triangle, on page 10. During this lesson, you will learn how to label the three vertices of the triangle and how to measure the lengths of the sides of the triangle. But first you need to learn how to get uppercase (capital) letters with the TI-92 calculator.

Typing Uppercase (Capital) Letters

You can get uppercase (capital) letters in one of two ways:

1. By using the upper arrow [↑] key - Using this key makes the next letter entry uppercase. Letters typed afterwards are lowercase.
2. By using the **2nd** and **Z** keys - Using this key combination makes all letters typed afterwards uppercase letters. To change back to lowercase letters you will need to press the **2nd** and **Z** keys again. The calculator automatically returns to lowercase letters when a new geometry session is started.

Labeling Vertices of Triangle

After you have drawn the triangle, you need to label the vertices of the triangle **A**, **B**, and **C**. The following description will explain how to label and reposition vertex A. You follow the same procedure to label and reposition vertices B and C.

Typing Label A

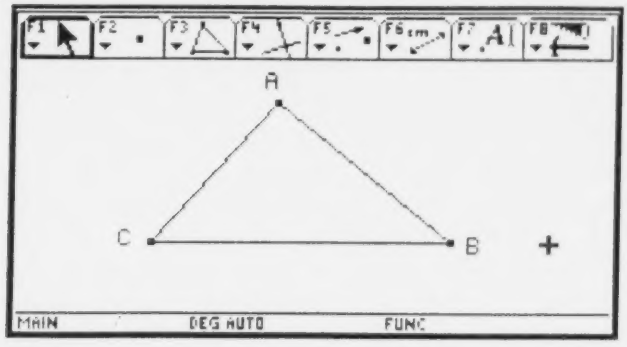
To get the labeling tool, press **F7**. Use the cursor pad to scroll down to highlight **4: Label** and then press an **ENTER** key. Use your cursor pad to move the screen cursor to the top vertex of your triangle. The words "**THIS POINT**" should appear on the screen. Press an **ENTER** key. A small labeling box with a flashing cursor will appear on the screen. Type an uppercase (capital) A for the vertex name. If you made a mistake, then press the backspace key to delete the mistake.

Repositioning Label A

Most times when you label a vertex of a geometric figure, the label is not in the correct position (the label may be on the geometric figure or on the inside of the geometric figure or at some other position on the screen where we do not want it to be). You can move the label using

the dragging technique that you learned in lesson 1(see page 13). Remember, first we need to get the pointer tool. To do this, press **F1** and use the cursor pad to highlight **1: Pointer** and then press an **ENTER** key. Use your cursor pad to move the screen cursor to the label A. The words "**THIS LABEL**"will appear on the screen. *Press and hold down* the **HAND LOCK** key and use the cursor pad to drag label A to its proper position.

Now label and reposition vertices B and C. Your triangle should be similar to the one in the following diagram.



Using the Measuring Tool to Measure the Sides of Triangle ABC

Your teacher will have you measure the sides of your triangle ABC using a ruler. Write your answers in the column **Ruler Measure** in the recording table for Measures of Sides of Triangle ABC (supplied by your teacher).

You will use the TI-92 calculator to measure the lengths of the three sides of triangle ABC. The following description will explain how to measure and reposition the measure of side AB. You follow the same procedure to measure and reposition the measures of sides BC and AC. After you have made your measurements, write them in the column **TI Measure** in the table for Measures of Sides of Triangle ABC.

Measuring Side AB of Triangle ABC

Remember the measuring tools on the TI-92 calculator are listed under **F6**. Press **F6**. Use your cursor pad to highlight **1: Distance & Length** and then press an **ENTER** key. In order to measure the length of side AB, we need to measure the distance from point A to point B. First use your cursor pad to move the screen cursor to vertex A of triangle ABC (not the label A but the vertex of the triangle). The words "**DISTANCE FROM THIS POINT**" will appear on the screen. Press an **ENTER** key. Now use your cursor pad to move the screen cursor to vertex B of triangle ABC (not the label B but the vertex of the triangle). The words "**TO THAT POINT**" will appear on the screen. Press an **ENTER** key. The length of side AB should appear on the screen. Write this value in the table for Measures of Sides of Triangle ABC.

Repositioning the Measure of Side AB

Most times when you measure the side of a geometric figure, the measure is not in the correct position (the measurement may be on the geometric figure or on the inside of the geometric figure or at some other position on the screen where we do not want it to be). You can move the measure using the dragging technique that you used to move the labels. Remember, first we need to get the pointer tool. To do this, press **F1** and use the cursor pad to highlight **1: Pointer**

and then press an **ENTER** key. Use your cursor pad to move the screen cursor to the measure of side AB. The words "**THIS NUMBER**" should appear on the screen. If the words "**WHICH OBJECT**" appear on the screen, then press an **ENTER** key. You will then get a list of possible choices. Highlight the choice "**THIS NUMBER**" and press an **ENTER** key. *Press and hold down* the **HAND LOCK** key and use the cursor pad to drag the measure to its proper position.

Now measure sides BC and AC and then reposition these measures. Record the measures of AC and BC in the table for Measures of Sides of Triangle ABC. Calculate the differences between the ruler measures and the TI measures for each of the three sides. Are the measures different? If the measures are different, then why do you think they are different?

Use the TI measures of the sides AB, BC, and AC to calculate the perimeter of triangle ABC. Write the answer in the table for Measures of Sides of Triangle ABC.

We will now use the TI-92 calculator to find the perimeter of triangle ABC.

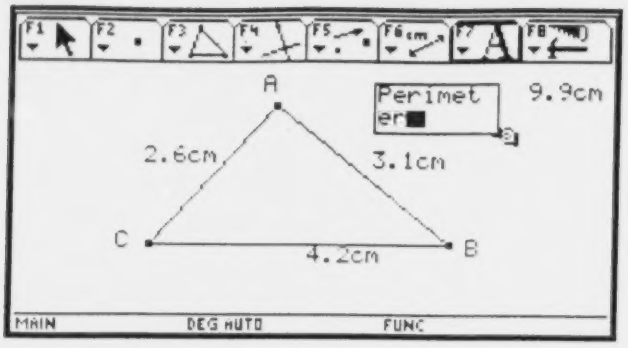
Perimeter of Triangle ABC

Remember the measuring tools on the TI-92 calculator are listed under **F6**. Press **F6**. We will now use a shortcut to get our choice from the list under **F6**. Press the number 1 on your calculator. Notice that is the same as using your cursor pad to highlight **1: Distance & Length** and then pressing an **ENTER** key. In order to get the perimeter of triangle ABC, we need to use the cursor pad to move the screen cursor to any side of triangle ABC. The words "**PERIMETER OF THIS TRIANGLE**" will appear on the screen. Press an **ENTER** key. The perimeter of triangle ABC will appear on the screen. Record this value in the table for Measures of Sides of Triangle ABC and compare this value to the value for the perimeter that you calculated.

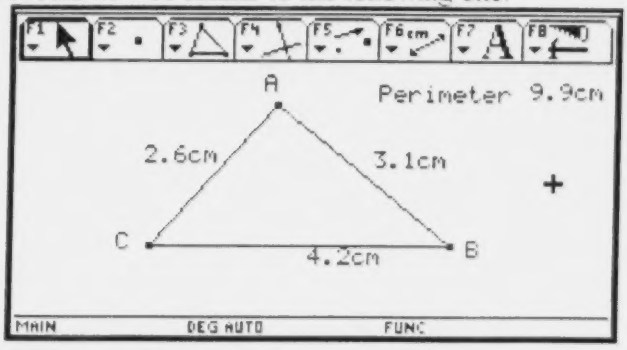
When you draw geometric figures and then measure them, you can have many numbers on the screen. You need a way to remember what each number represents. We can use the **Comment Box** to give a name for numbers. First, use the dragging technique to move the value for the perimeter of triangle ABC to the top right hand corner of the screen. You will now use the TI-92 calculator's **Comment Box** to give the name **Perimeter** to this number.

Comment Box

The comment box tool is located under **F7** (choice **5: Comment**). Press the number 5. Your screen cursor should change to a four headed arrow **[✥]**. Use the cursor pad to position the screen cursor to the right of the number for the perimeter of triangle ABC. Press an **ENTER** key. You should get a **Comment Box**. Type the word, **Perimeter**, in this box. Do not forget to capitalize the letter P and to type slowly. If you make a mistake spelling "**Perimeter**", use the backspace key to erase your mistakes. You will notice that the word perimeter is on two different lines. We need to widen the comment box. To do this position the screen cursor at the bottom right hand corner of the **Comment Box**. *Press and hold down* the **HAND LOCK** key while you use the cursor pad to drag the corner of the **Comment Box** to the right.



Drag the corner of the **Comment Box** sufficiently far to the right so that the word "**Perimeter**" is all on the same line. When you are finishing typing in the **Comment Box** press the **ESC** key. This returns you to the geometry screen. If the word, **Perimeter**, is not positioned correctly on the screen use the dragging technique to move it to a new location (refer to page 13). Your geometry screen should now be similar to the following one:



Return to the home screen (refer to page 15). This automatically saves your triangle construction. Your teacher will now explain to you how to open this geometry session. The following section outlines this procedure.

Opening a Previous Geometry Session

To open your geometry session, complete the following steps:

1. Press the **APPS** key and choose **8: Geometry** by pressing the number 8 on the calculator.
2. Choose **2: Open** by pressing the number 2 on the calculator.
3. The word **main** to the right of the word "**Folder:**" should be blinking. Press on the right hand side of your cursor and choose your folder by pressing the number of your folder.
4. Your folder's name should now be blinking to the right of the word "**Folder:**". If not, you chose the wrong folder. In this case, repeat step 3 and choose your folder.
5. Press down on the cursor pad and the screen cursor should be blinking on the word "**tri**" (the name of your geometry session) to the right of the word "**Variable:**"
6. Press an **ENTER** key.
7. You should get a geometry screen displaying your triangle.

When you have finished opening your geometry session "**tri**" return to the home screen again

Problem

Now start a new geometry session and name it **quad**. Do not forget to use your own folder. Complete the following:

a. Set the precision of calculator measurements to tenths.
b. Use the polygon tool to draw a quadrilateral.
c. Label the quadrilateral PQRS.
d. Use the drag tool to reposition the labels P, Q, R, and S.
e. Use the measuring tool to measure the sides PQ, PS, QR, RS.
f. Use the drag tool to reposition the measures of sides PQ, PS, QR, RS.
g. Use the measuring tool to find the perimeter of quadrilateral PQRS.
h. Use the drag tool to reposition the perimeter of quadrilateral PQRS to the top right corner of the screen.
i. Use the **Comment Box** to place the word "**Perimeter**" to the left of the number that represents the perimeter of quadrilateral PQRS.

Lesson 3
File Management, and Labeling, Marking, and Measuring Angles

Part 1 - Drawing, Labeling, Marking, Measuring, and Resizing an Angle

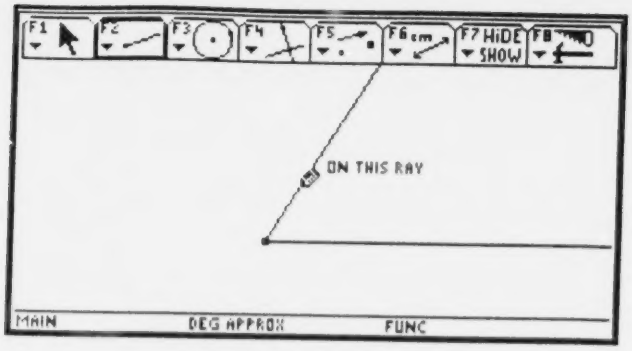
Drawing an Angle

Remember an angle is formed by two rays with the same endpoint. Therefore, to draw an angle with the TI-92 calculator, we need to draw two rays from the same endpoint. First you need to start a new geometry session. If you do not remember how to start a new geometry session refer to the section, Starting a New Geometry Session Using Your New Folder, on page 18. Do not forget to use your own folder. We will call this new geometry session "**ang**". When your new geometry session "**ang**" is opened you need to set the precision of TI-92 calculator measurements to tenths. If you do not remember how to set the precision to tenths refer to the section, Setting the Precision of your TI-92 Calculator Measurements, on page 20. When you have set the calculator precision to tenths, you can complete the following procedures for drawing, labeling, marking, and measuring angles. Your teacher will permit you to complete these sections on your own. If you have difficulty understanding the instructions, ask your teacher for help.

Drawing Rays for Angle

The ray drawing tool is located under **F2**. Remember that to draw a ray, we need to define the endpoint of the ray and the direction of the ray. Therefore, we will have to press an **ENTER** key twice. Complete the following steps to draw the angle.

1. Press **F2**.
2. Press the number 6. Remember this is the shortcut for executing the function (using the cursor pad to highlight **6: Ray** and then pressing an **ENTER** key).
3. Use the cursor pad to move the screen cursor [✎] to the bottom and the middle of the screen.
4. Press an **ENTER** key. A blinking point should appear on the screen.
5. Use the cursor pad to move the screen cursor towards the right hand side of the screen. A ray should follow behind the screen cursor.
6. Press an **ENTER** key. You should now have your first ray on your screen. We now need to draw the second ray to make the angle.
7. Use the cursor pad to move the screen cursor [✎] to the endpoint of your first ray. You should see the words "**THIS POINT**" on the screen.
8. Press an **ENTER** key.
9. Use the cursor pad to move the screen cursor towards the top of the screen. A ray should follow behind the screen cursor.
10. Press an **ENTER** key. You should now have two rays forming an angle on your screen. You should now have a diagram on your screen similar to the following one.

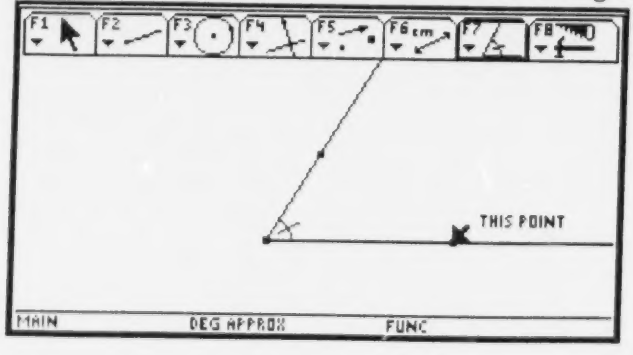


Marking Angle

We now want to mark our angle. The marking tool is located under **F7**. Complete the following steps to mark the angle that you just completed.

1. Press **F7**.
2. Press the number 7 to choose the **Mark Angle** tool.
3. Move your screen cursor to one of the rays. You should see the words "**ON THIS RAY**" on the screen.
4. Press an **ENTER** key. A point should appear on the ray.
5. Move the screen cursor to the endpoint of both rays. You should see the words "**THIS POINT**" on the screen.
6. Press an **ENTER** key.
7. Move the screen cursor to the other ray. You should see the words "**ON THIS RAY**" on the screen.
8. Press an **ENTER** key. A point should appear on the second ray. A mark should appear at the common endpoint of the two rays (the angle).

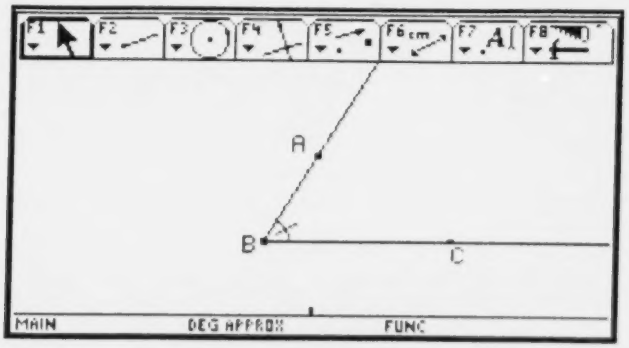
You should now have a diagram on your screen like the following one.



9. You can resize (make larger or smaller) the angle mark. To resize the angle mark, choose **1: Pointer** under **F1**. Position the screen cursor next to the mark that intersects the angle mark. You should see "**THIS MARK**" on the screen. *Press and hold down* the **HAND LOCK** key and use the cursor pad to drag the angle mark. The angle mark will become larger or smaller.

Labeling Angle

Now label your angle ∠ABC. This means that the common endpoint of the two rays should be labeled B and the points on the two rays should be labeled A and C. If you forgot how to label points then review section, Labeling Vertices of Triangle, on page 22. Reposition labels A, B and C to suitable locations on the screen. You should now have a diagram on your screen like the following one.

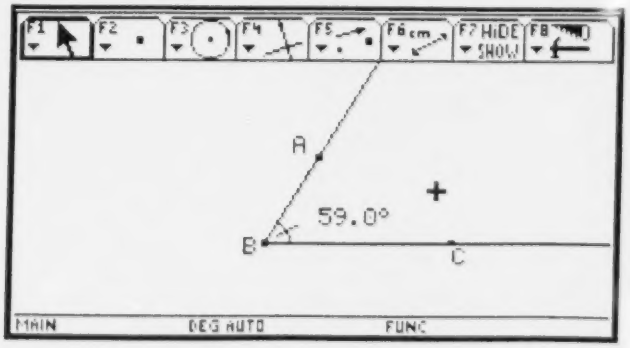


Measuring Angle

Your teacher will now ask some students to connect their calculators to the TI-92 overhead projector. This will project your angle on the overhead screen. The teacher will help you measure your angle with the classroom protractor. Write this measurement in the table for Angle Measure (supplied by our teacher).

Now you will use the measuring tools of the TI-92 calculator to measure the ∠ABC. Remember the measuring tools are listed under **F6**. To complete this procedure complete the following steps.

1. Press **F6**.
2. Press the number 3. This is the tool for measuring angles.
3. Move the screen cursor to the mark on ∠ABC. You should see either the words "**THIS MARK**" or the words "**THIS ANGLE**" on the screen.
4. Press an **ENTER** key. The measure of ∠ABC should appear on the screen.
5. Use the **HAND LOCK** key to reposition this angle measure to a suitable location. If you forgot how to move numbers then review the section, Repositioning the Measure of Side AB, on page 23. You should now have a diagram on your screen similar to the following one.



The students who had their angles measured using the classroom protractor now should report their TI-92 measurements to the class. Each student in the class should now write these TI-92 measurements in the table for Angle Measure. Were there any differences between the protractor angle measurements and the TI-92 calculator angle measurements? If so, why are the two measurements different?

Resizing Angle

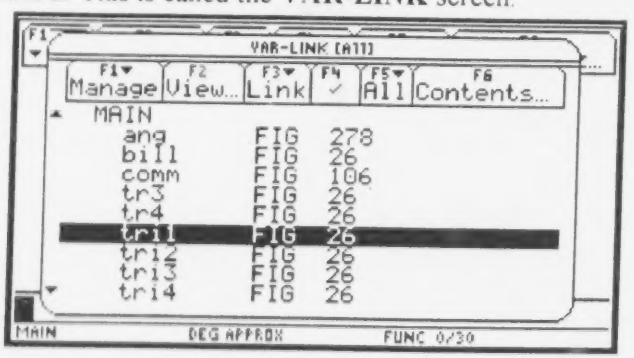
You are now going to make ∠ABC smaller and larger. To do this you will use the **HAND LOCK** key to drag ray AB. As you make ∠ABC smaller or larger you will write its measure in the recording table for Resizing Angles (supplied by your teacher). You will also decide whether the angle is acute, right, obtuse, or straight. Remember acute angles have measures greater than zero and less than 90 degrees, right angles have measures of 90 degrees, obtuse angles have measures greater than 90 and less than 180 degrees, and straight angles have measures of 180 degrees.

Write the present measure of ∠ABC in the recording table for Resizing Angles. Remember that to drag ray AB we need to choose the pointer tool under **F1**. After you have chosen the pointer tool, use the cursor pad to position the screen cursor on ray AB. You should see "**THIS RAY**" on the screen. *Press and hold down* the **HAND LOCK** key while you use the cursor pad to drag ray AB. Write four other measures for ∠ABC in the table for Resizing Angles. For each measure decide whether ∠ABC was acute, right, obtuse, or straight and write this in the column, Type of Angle, in the recording table for Resizing Angles. If in the process of trying to get your four additional angle measures the angle mark jumps to the other side of the angle then move the screen cursor to the mark on the angle mark (you should see "THIS MARK" on the screen) and drag the angle mark back to the correct side of the angle.

After you have completed the angle activity, return to the home screen. You will now copy a geometry session to your folder. This geometry session contains a labeled triangle. Your teacher will guide you through this procedure.

Part 2 - Copying a Geometry Session

1. Press one of the **2nd** keys.
2. Press the **minus [-]** key. You should now see a screen similar to the one below. If not, repeat steps 1 and 2. This is called the **VAR-LINK** screen.

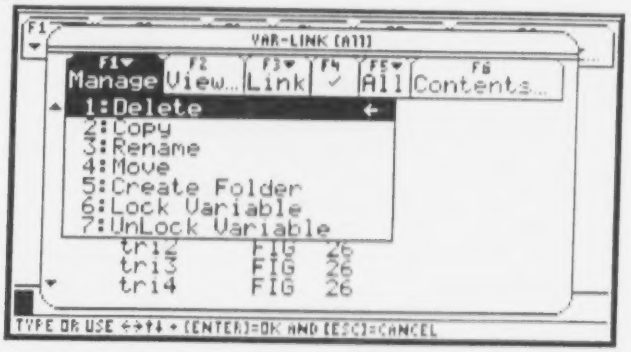


3. In the **MAIN** folder, there is a geometry session called **tri1**. Use the cursor pad to highlight this session.

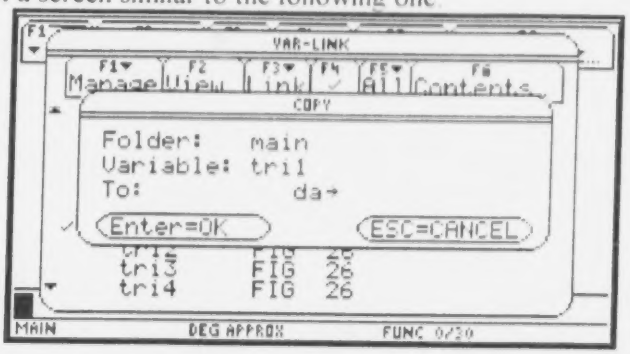
4. We want to checkmark this session. Check to see if there is a checkmark [✔] to the left of this session. If there is no checkmark to the left of this session, then press **F4**. If there is a checkmark to the left of this session, go to step 5.

5 Use the cursor pad to scroll down through all geometry sessions in all folders. If any sessions or folders, other than **tri1**, are checkmarked [✔], then press **F4** to uncheckmark the sessions or folders. Remember the TI-92 calculator saves folders in uppercase (capital) letters and sessions in lowercase letters. When you are finished, the only session that should be checkmarked is **tri1**. No folders should be checkmarked.

6 When the only session checkmarked [✔] is **tri1**, then press **F1**. You should see the following choices.

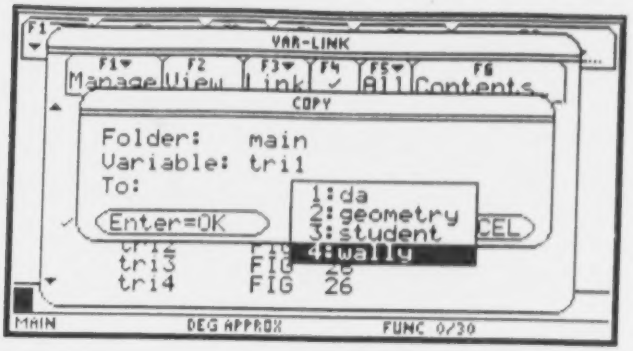


7. To copy the checkmarked [✔] sessions, choose **2: Copy** by pressing the number 2. You should now get a screen similar to the following one.



8. All sessions to be copied are listed after the word "**Variable:**". Therefore, the only session that should be listed after **Variable:** should be **tri1**. If other sessions or folders are listed after **Variable:**, you need to press the **ESC** key and repeat steps 3 to 7.

9 You now need to identify the copied **to: folder**. Press on the right hand side of the cursor. From the list of highlighted folders, use the cursor pad to highlight your folder. Your screen should be like the following one.



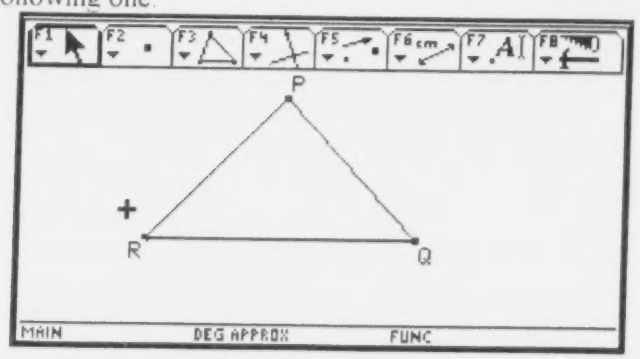
10 Press an **ENTER** key.

11 As a last precaution, check the Copy dialog box to make sure all information is now correct. If all information is correct, then press an **ENTER** key. If the list of sessions is not right, press the **ESC** key and repeat steps 3 to 10. If the copied **to: folder** is not right, then repeat steps 9 and 10.

12 Press the **ESC** key to return to the home screen.

Part 3 - Marking, Measuring, and Repositioning the Three Angles of a Triangle

Your teacher will now let you complete this procedure on your own. First you need to open the geometry session "**tri1**" that is in your folder. If you forget how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 23. You should get a screen similar to the following one:



You will now use the procedure for marking and measuring angles to mark and measure ∠PQR, ∠PRQ, and ∠QPR. Remember after measuring an angle, reposition the measure of the angle to an appropriate place in the drawing. The description for marking and measuring ∠PQR follows. Use the same techniques to mark and measure ∠PRQ and ∠QPR.

Marking ∠PQR

1 Press **F7**.

2 Press the number 7 to choose **Mark Angle**.

3 Use the cursor pad to move the screen cursor to point P. The words "**THIS POINT**" should appear on the screen.

4 Press an **ENTER** key.

5 Use the cursor pad to move the screen cursor to point Q. The words "**THIS POINT**" should appear on the screen.

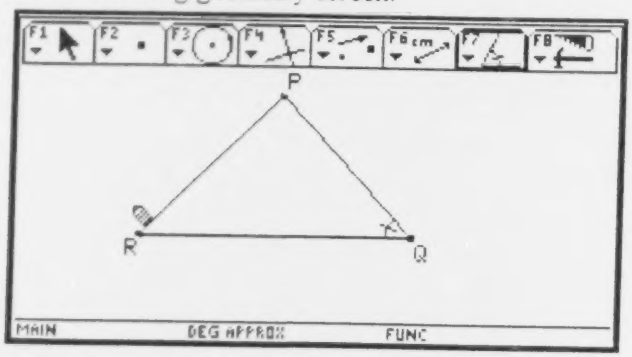
6 Press an **ENTER** key.

7 Use the cursor pad to move the screen cursor to point R. The words "**THIS POINT**" should appear on the screen.

8 Press an **ENTER** key.

9 ∠PQR should now be marked.

You should have the following geometry screen:



Measuring ∠PQR

Remember the measuring tools are listed under **F6**.

1 Press **F6**.

2 Press the number 3 to choose the measuring tool for **Angle**.

3 Use the cursor pad to move the screen cursor to ∠PQR. Move the screen cursor around until either the words "**THIS ANGLE**" or the words "**THIS MARK**" appear on the screen.

4 Press an **ENTER** key. The measure of ∠PQR should appear on the screen.

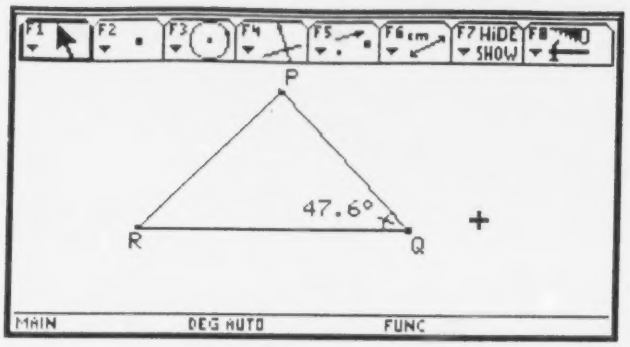
Repositioning the Measure of ∠PQR

Remember that to reposition a number on the screen, we need to select the pointer tool under **F1**.

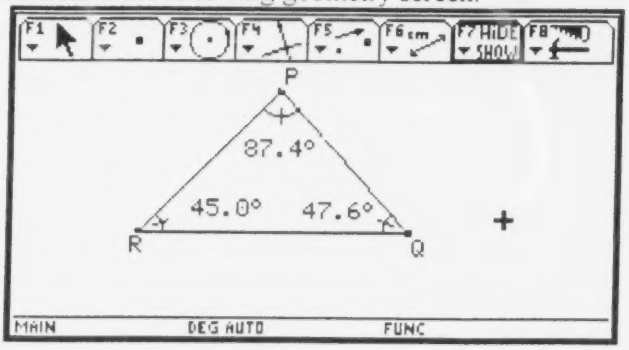
1 Press **F1**.

2 Press the number 1 to choose **Pointer** tool.

3 Use the cursor pad to move the screen cursor to the measurement of ∠PQR. The words "**THIS NUMBER**" should appear on the screen. If the words "**WHICH OBJECT**" appear on the screen, then press an **ENTER** key. You will then get a list of possible choices. Highlight the choice "**THIS NUMBER**" and press an **ENTER** key. While holding down on the **HAND LOCK** key, use the cursor pad to reposition the angle measurement in a suitable location in the interior of △PQR. You should now have the following screen



Now use the same techniques described for marking, measuring, and repositioning ∠PQR to mark and measure ∠PRQ and ∠QPR and then reposition the measures of ∠PRQ and ∠QPR in their appropriate places in the top right hand corner of the calculator screen. After you have completed this, you should have the following geometry screen:



Problem

In the main folder on your TI-92 calculator, there is a geometry session called **pent**. Copy this session to your folder and then open the session. Complete the following for the geometry session "**pent**".

1. Mark ∠DEF, ∠EFG, ∠FGH, ∠GHD, and ∠HDE.
2. Measure ∠DEF, ∠EFG, ∠FGH, ∠GHD, and ∠HDE.
3. Reposition the measures of ∠DEF, ∠EFG, ∠FGH, ∠GHD, and ∠HDE in suitable locations in the interior of pentagon DEFGH.

Lesson 4

File Management, Parallel Lines, and Regular Polygons

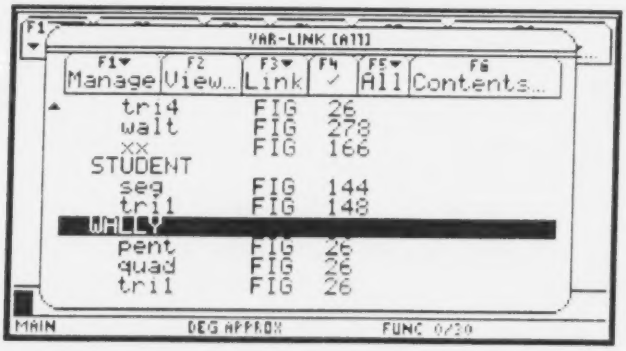
After completing many geometry sessions you need to organize the sessions in some kind of logical fashion. Since many other students are using the same calculator as you, you place your geometry sessions in your folder. However, some of the geometry sessions that you have completed, you no longer need. Therefore you need to delete the geometry sessions you no longer need. This frees up the calculator's memory for saving new geometry sessions. Your teacher will explain to you how you can delete geometry sessions from your folder. The instructions for deletion of geometry sessions are also outlined below.

Part 1 - File Management

You will delete the geometry sessions, **ang**, **pent**, **quad**, and **tri1** from your folder. Your teacher will explain this procedure to you. The steps are outlined below.

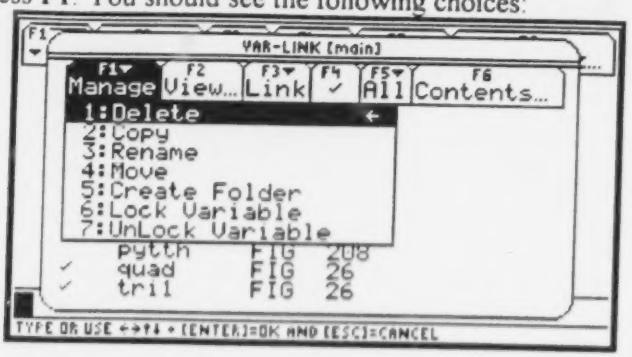
Deletion of Geometry Sessions

1. Press the **2nd** key.
2. Press the **minus [−]** key.
3. You should now see a screen similar to the one below. If not, repeat steps 1 and 2. This is called the **VAR-LINK** screen.

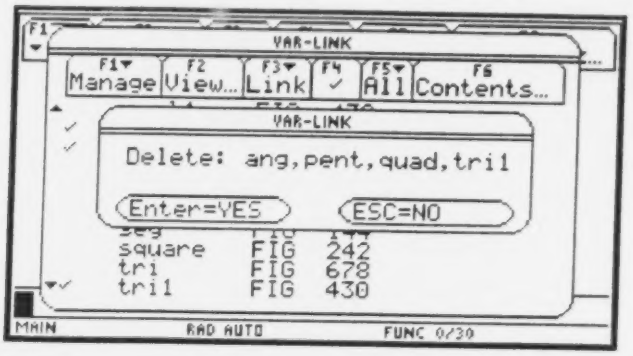


4. Use the cursor pad to highlight your folder. Remember folders are always listed in uppercase (capital) letters.
5. Use the cursor pad to highlight the geometry session "**ang**" in your folder. Remember geometry sessions are always listed on the screen in lowercase letters.
6. We want to checkmark this session. Check to see if there is a checkmark [✔] to the left of this session. If there is no checkmark to the left of this session then press **F4**. If there is a checkmark to the left of this session, go to step 7.
7. Repeat steps 4 and 5 to checkmark [✔] the geometry sessions "**pent**", "**quad**", and "**tri1**" in your folder.
8. Before proceeding to delete the sessions, **ang**, **pent**, **quad**, and **tri1**, in your folder, scroll down through all the sessions and folders and make sure that only the sessions that are checkmarked [✔] are **ang**, **pent**, **quad**, and **tri1** in your folder. If you need to uncheckmark a session or folder, press **F4** when the session or folder is highlighted. This will remove the checkmark [✔] from in front of this session or folder.

9 When the only sessions that are checkmarked [✔] are **ang**, **pent**, **quad**, and **tri1** in your folder, then press **F1**. You should see the following choices:



10 Choose **1: Delete** by pressing the number 1. You should get a screen similar to the following one:



11 All sessions to be deleted are listed after the word "**Delete:**". If the only session names that are listed are **ang**, **pent**, **quad**, and **tri1**, then press an **ENTER** key. If some of these sessions names are not right, then press the **ESC** key and repeat steps 7 to 10.

12 This deletes all checkmarked [✔] sessions. Thus, the geometry sessions, **ang**, **pent**, **quad**, and **tri1**, in your folder are now deleted. Scroll down through your folder to check that these two sessions are deleted.

13 Press the **ESC** key to return to the home screen.

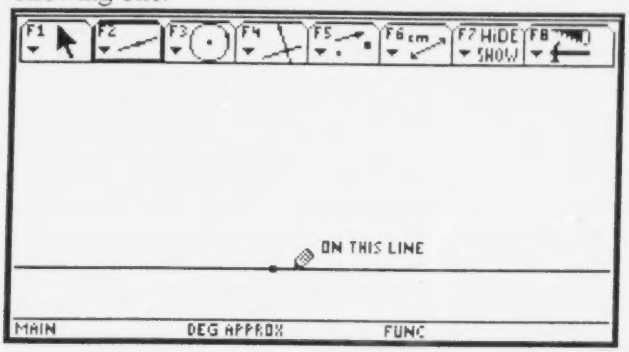
Part 2 -Drawing and Testing Parallel Lines

In this section, you will learn four new tools on the TI-92 calculator: drawing lines, drawing parallel lines, placing points at lines of intersection, and testing lines to determine whether they are parallel. Remember that two lines are parallel if they are in the same plane and never meet when they are extended indefinitely in both directions. You will first use the TI-92 calculator to draw two parallel lines. Start a new geometry session and call it **parl**. Make sure to place the session in your folder. If you forgot how to start a new geometry session refer to the section, Starting a New Geometry Session Using Your New Folder, on page 18.

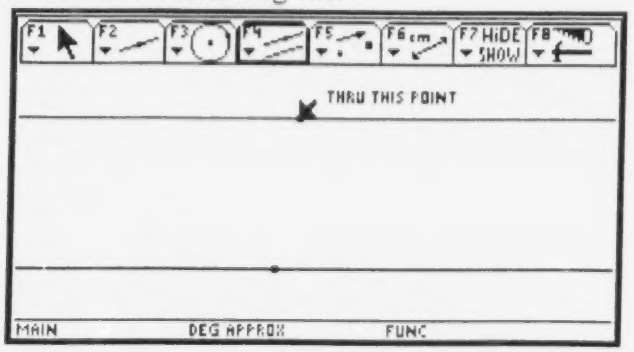
Drawing Parallel Lines

The procedure for drawing two parallel lines is described below. Complete this procedure on your own. Ask your teacher for help if you do not understand the directions.

1. First you need to draw a line on the calculator screen. Position the screen cursor towards the bottom center of the screen. The line tool is listed under **F2**. So press **F2.**
2. Press the number 4 to select the tool for drawing a **Line**.
3. Press an **ENTER** key. A flashing point should appear at the end of your screen cursor.
4. Press the right hand side of the cursor pad. A line should appear on the screen.
5. Press one of the **ENTER** keys to define the line. You should now have a figure on your screen like the following one.



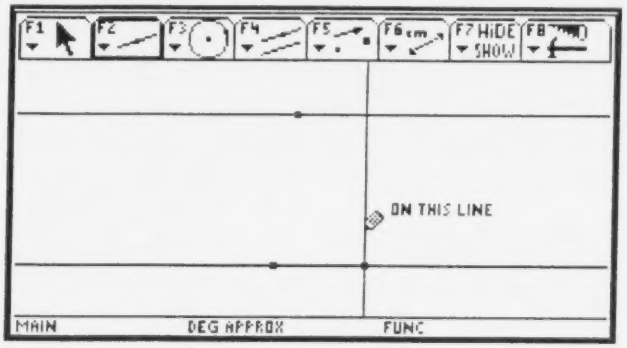
6. Now you want to draw a line parallel to the line that you just drew on the screen. The parallel line tool is listed under **F4**. Thus press **F4**.
7. Press the number 2 to select the **Parallel Line** tool.
8. Use the cursor pad to position the screen cursor on the line that you just drew. You should see the words "**PARALLEL TO THIS LINE**" on the screen.
9. Press an **ENTER** key. You should see the words "**ON THIS LINE**" on the screen. Your line should now be dotted.
10. Use the cursor pad to move the screen cursor towards the top center of the screen.
11. Press an **ENTER** key. The TI-92 calculator draws a line parallel to the first one. You should see the words "**THRU THIS POINT**" on the screen. You should now have a figure on your screen like the following one.



Drawing a Transversal for the Two Parallel Lines

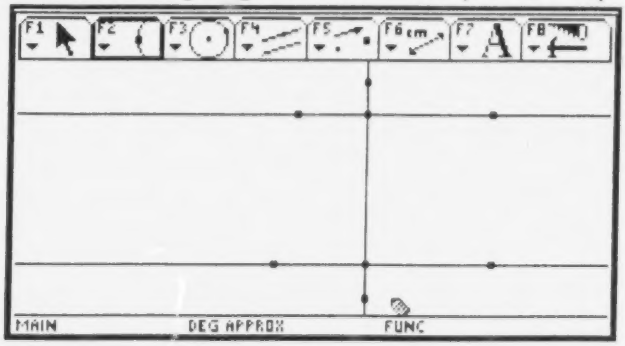
A transversal is a third line that intersects both parallel lines. You will now use the line tool to draw a transversal for the two parallel lines.

1. Press **F2**.
2. Press the number 4 to select the **Line** tool.
3. Use the cursor pad to move the screen cursor to the line at the bottom of the screen. Position the screen cursor to the right of the point on this line. The words "**ON THIS LINE**" should appear.
4. Press an **ENTER** key. A vertical line will appear.
5. Use the cursor pad to move the screen cursor slightly up the screen. Make sure the transversal is to the right of the point on the second parallel line.
6. Press an **ENTER** key.
7. Your transversal is now defined. You should now have a figure on your screen similar to the following one:



Placing Points on the Transversal and the Parallel Lines

Your transversal and two parallel lines have three points on them. You need to place five more points on the lines. The following diagram shows where you should place your extra points.



Complete the following procedure to accomplish this.

1. First we want to place a point at the point of intersection of the transversal and the top parallel line. The tool for **Intersection Point** is listed under **F2**. Thus press **F2**.
2. Press the number 3 to select **Intersection Point** tool.

3 Use the cursor pad to move the screen cursor to the intersection of the transversal and the parallel line towards the top of the screen. The words "**POINT AT THIS INTERSECTION**" should appear on the screen.

4 Press an **ENTER** key. A point appears at the point of intersection.

5 We now want to place a point on the transversal above the top parallel line. To do this we need to use the **Point on Object** tool. This is listed under **F2**. So press **F2**.

6 Press the number 2 to select **Point on Object** tool.

7 Use the cursor pad to position the screen cursor on the transversal above the top parallel line. You should see the words "**ON THIS LINE**" on the screen.

8 Press an **ENTER** key. A point should appear on the transversal.

9 Now move the screen cursor to the top parallel line to the right of the transversal. You should see the words "**ON THIS LINE**" on the screen.

10 Press an **ENTER** key. A point should appear on the top parallel line to the right of the transversal.

11 Now move the screen cursor to the bottom parallel line and to the right of the transversal. You should see the words "**ON THIS LINE**" on the screen.

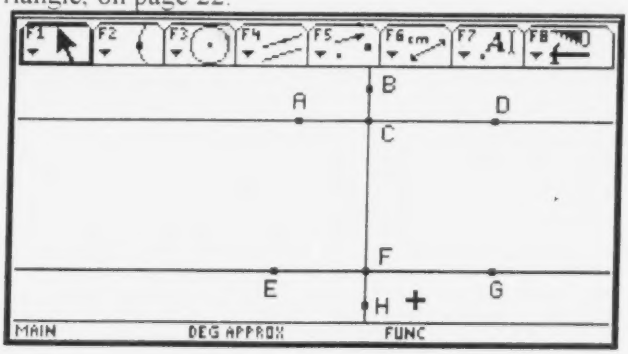
12 Press an **ENTER** key. A point should appear on the bottom parallel line to the right of the transversal.

13 Now move the screen cursor to the part of the transversal that is below the bottom parallel line. You should see the words "**ON THIS LINE**" on the screen.

14 Press an **ENTER** key. A point should appear on the transversal.

Labeling Points

There should be a total of 8 points on the diagram. You need to label these points. Label the points as in the following diagram. If you forgot how to label points refer to the section, Labeling Vertices of Triangle, on page 22.



Testing Lines to Determine if They Are Parallel

After you have completed drawing and labeling your parallel lines and transversal return to the home screen. You will now copy four geometry sessions that are located in the main folder to your folder. The geometry sessions are called **pl2**, **pl3**, **pl4**, and **pl5**. If you forgot how to copy a geometry session refer to the section, Copying a Geometry Session, on page 29. Open the geometry session **pl2**. If you forgot how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25.

Complete the following steps to determine if the two lines in geometry session "**pl2**" are parallel.

1. The **Check Property** tool is located under the listing of **F6**. So press **F6**.
2. Press the number 8 to get the **Check Property** tool.
3. Press the number 2 to select the **Check Property Parallel** tool.
4. Move the screen cursor to one of the lines. The words "**IS THIS LINE**" should appear on the screen. Press an **ENTER** key. The line should become dotted.
5. Move the screen cursor to the other line. The words "**PARALLEL TO THIS LINE**" should appear. Press an **ENTER** key. A dotted box should appear.
6. Press an **ENTER** key. Either the words "**NOT PARALLEL**" or "**PARALLEL**" will appear. This tells you whether the two lines are parallel.
7. Return to the home screen.
8. Repeat steps 1 to 7 for each of the geometry sessions, **pl3**, **pl4**, and **pl5**.

Part 3 - Investigations of the Properties of Regular Pentagons

You will work in pairs to complete this activity. Your teacher will give you instructions on how to choose your partner. One person in the group will work with the calculator and the other will write the data in the recording table. You can alternate roles if you wish. Therefore, before beginning this activity you need to shut off one of the calculators. Do not forget to go to the home screen before turning off the calculator. Follow the instructions carefully. If you do not understand the instructions, discuss the problem between the two of you first. Only after the two of you decide that you do not understand the instructions can you ask your teacher for help.

Drawing Regular Pentagon

1. Start a new geometry session and name it **regp**. Make sure to place the session in your folder. If you forgot how to start a new geometry session refer to the section, Starting a New Geometry Session Using Your New Folder, on page 18.
2. Set the precision of calculator measurements to tenths. If you do not remember how to set the precision to tenths refer to the section, Setting the Precision of your TI-92 Calculator Measurements, on page 20.
3. Draw a regular pentagon (five sided regular polygon). If you forgot how to draw a regular polygon refer to the section, Drawing a Regular Polygon, on page 12.
4. Label the vertices of the regular pentagon A, B, C, D, and E. Make sure that you use uppercase (capital) letters. If you forgot how to label vertices refer to the section, Labeling Vertices of a Triangle, on page 22. Reposition the labels to suitable locations on the drawing.

Sometimes you will want to work with the same geometry diagram more than once. Therefore, you will need to make a copy of the geometry session. You will now make a copy of this geometry session so that you will be able to work with this session two times. Return to the home screen (refer to page 15).

Making a Copy of a Geometry Session

1. Press one of the **2nd** keys.
2. Press the **minus [-]** key to get the **VAR-LINK** screen.
3. Scroll down to highlight the geometry session **regp** in your folder.
4. Press **F1**.

5. Press the number 2 to select **2:Copy**.
6. Press an **ENTER** key to copy the geometry session **regp** to the main folder.
7. Use the cursor pad to scroll and highlight the geometry session **regp** in the main folder. We will now rename this session.
8. Press **F1**.
9. Press the number 3 to select **3:Rename**.
10. Type the new name **regp2** in the **To:** dialog box. The geometry session **regp** in the main folder has now been renamed **regp2**.
11. You will now move the geometry session **regp2** to your folder. To do this scroll and highlight the geometry session **regp2** in the main folder.
12. Press **F1**.
13. Press the number 4 to select **4:Move**.
14. Press right on the cursor pad and highlight your folder. Press an **ENTER** key.
15. Press an **ENTER** key. You should now have two copies of the geometry session **regp** (regp and regp2) in your folder.

Measuring Sides of Regular Pentagon

1. Open the geometry session **regp** that is in your folder. If you forgot how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25.
2. Measure the length of each side of the regular pentagon and write these measurements in the recording table for Regular Pentagon (supplied by your teacher). If you forgot how to measure sides refer to the section, Using the Measurement Tool to Measure the Sides of Triangle ABC, on page 23.
3. Resize the regular pentagon by dragging one of its vertices. Write the lengths of the sides in your recording table for Regular Pentagon.
4. Repeat step 3 to get 3 more sets of measurements. You should have a total of 5 sets of measurements. Write the lengths of the sides in your recording table for Regular Pentagon.

Measuring Angles of Regular Pentagon

1. Open the geometry session **regp2** that is in your folder. If you forgot how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25.
2. Mark each angle of the regular pentagon. If you forgot how to mark angles refer to the section, Marking Angle, on page 28.
3. Measure each angle of the regular pentagon and write these measurements in the recording table for Regular Pentagon (supplied by your teacher). If you forgot how to measure angles refer to the section, Measuring Angle, on page 29.
4. Resize the regular pentagon by dragging one of its vertices. Write the angle measures in your recording table for Regular Pentagon.
5. Repeat step 4 to get 3 more sets of measurements. You should have a total of 5 sets of angle measurements. Write the angle measures in your recording table for Regular Pentagon.

What conclusions can you make about properties of a regular pentagon?

Problem

1. Start a new geometry session and name it **regh**. Make sure to place the session in your folder.
2. Set the precision of calculator measurement to tenths
3. Draw a regular hexagon (six sided regular polygon)
4. Label the vertices of the regular hexagon P, Q, R, S, T, and U. Make sure that you use uppercase (capital) letters.
5. Make a copy of regh in the main folder. Rename the copy of regh "regh2". Move regh2 to your folder.
4. Open the geometry session regh in your folder. Measure the length of each side of the regular hexagon and write these measurements in the recording table for Regular Hexagon (supplied by your teacher). Resize the regular hexagon by dragging one of its vertices. Write the lengths of the sides and the measures of the angles in the recording table for Regular Hexagon. Repeat the resizing to get 3 more sets of measurements. You should have a total of 5 sets of measurements. Write the lengths of the sides in the recording table for Regular Hexagon.
6. Open the geometry session regh2 in your folder. Mark and measure each of the six angles of the regular hexagon. Write the angle measurements in the recording table for Regular Hexagon. Resize the regular hexagon by dragging one of its vertices. Write the measures of the angles in the recording table for Regular Hexagon. Repeat step 6 to get 3 more sets of measurements. You should have a total of 5 sets of measurements. Write the measures of the angles in the recording table for Regular Hexagon.
7. What conclusions can you make about properties of a regular hexagon? What would be the measures of each angle in a regular octagon (eight sides)? regular decagon (ten sides)? Check your answers on the TI-92 calculator. Can you develop a general formula for the measure of each angle in a regular polygon?

Lesson 5

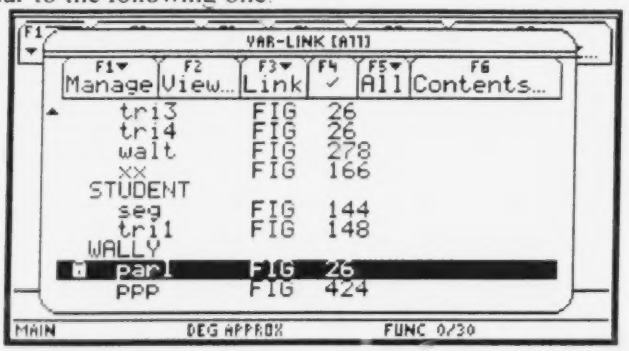
File Management and Review of TI-92 Geometry Application

Locking/Unlocking Geometry Sessions

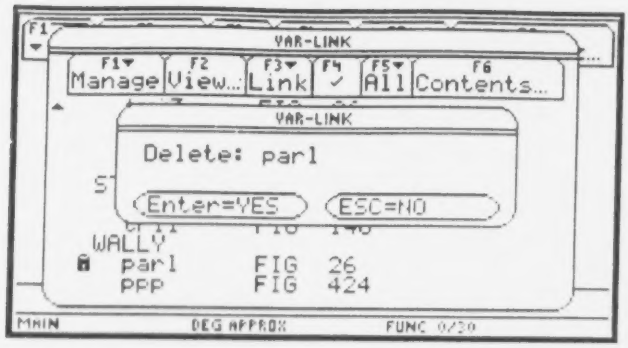
There are some geometry sessions that you will use later and therefore you want to be sure that they are not accidentally deleted. You can do this by locking the geometry session. This prevents accidental deletion of the session. If you decide later that you wish to delete the session, then you can unlock the session. After the session is unlocked, you can delete the session.

For this geometry unit we want to lock the geometry session named **parl**. To lock this session, complete the following steps.

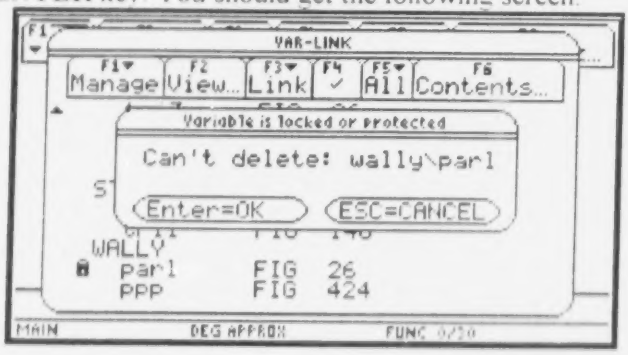
1. Press the **2nd** key.
2. Press the **minus [−]** key. You should now see the **VAR-LINK** screen.
3. Use the cursor pad to scroll down to your folder and highlight the geometry session "**parl**" in your folder.
4. Press **F1**.
5. Press the number 6 to choose the **Lock Variable** tool. A lock symbol should appear to the left of the geometry session "**parl**". You should now have a screen on your TI-92 calculator similar to the following one.



6. Before completing steps 7 and 8, make sure the session "**parl**" in your folder is locked. Use your cursor pad to scroll down through all sessions in all folders and make sure no folders or sessions are checkmarked.
7. Use the cursor pad to highlight **parl** in your folder. Press **F1**.
8. Press the number 1 to choose the **Delete** tool. You should get the following screen:



9 The only session listed after **Delete:** should be **parl**. If any other sessions are listed press the **ESC** key and complete steps 6 to 8 again. If the only session listed after **Delete:** is **parl**, then press an **ENTER** key. You should get the following screen.



10 You cannot delete the geometry session "**parl**" because you locked the session. Press the **ESC** key.

11 Press the **ESC** key again to return to the home screen.

To unlock a locked geometry session, go to the **VAR-LINK** screen, highlight the session, press **F1**, and press the number 7 to choose the **UnLock Variable** tool. This will unlock the session. You can be sure the session is unlocked if the lock symbol is not to the left of the session name.

Review Problems

Try to complete as many of the following problems without help. Refer to the appropriate sections in lessons 1 to 5 for help. If necessary, ask your teacher for assistance.

1 Delete the geometry sessions, **pl2**, **pl3**, **pl4**, **pl5**, **regp**, **regp2**, **regh** and **regh2** from your folder.

2 Open a new geometry session in your folder. Name the new session "**squ**". Complete the following.

a) Set the precision of calculator measurement to tenths.

b) Draw a square.

c) Label the vertices of the square A, B, C, D. Make sure to use uppercase (capital) letters. Position the vertex labels at suitable locations on the diagram.

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d) Find the lengths of the four sides of the square.

e) Find the perimeter of the square. Position the perimeter in the top right hand corner of the screen.

f) Use the **Comment Box** to identify the number that represents the perimeter.

g) Drag one of the vertices of the square. What happens to the lengths of the sides? the perimeter?

3 Copy the geometry session "**prob3**" from the main folder to your folder. Open the geometry session "**prob3**" that is in your folder. Complete the following:

a) Mark all angles in the figure.

b) Measure each of the angles in the diagram.

c) Drag one of the vertices of the diagram. What happens to the angle measures as you drag one of the vertices?

4 In this problem, work with one other student in your class. You will create three geometry sessions on your calculator. Your partner will create three sessions on his/her calculator. You will then exchange calculators and test the two lines drawn in each session to determine if the lines are parallel. Open a new geometry session in your folder. Name the session "**pr1**" Draw two lines on the screen. The lines may or may not be parallel. Repeat this procedure for two more geometry sessions. Name the sessions **pr2** and **pr3**.

5 Delete the geometry sessions, **squ**, **prob3**, **pr1**, **pr2**, and **pr3**, from your folder.

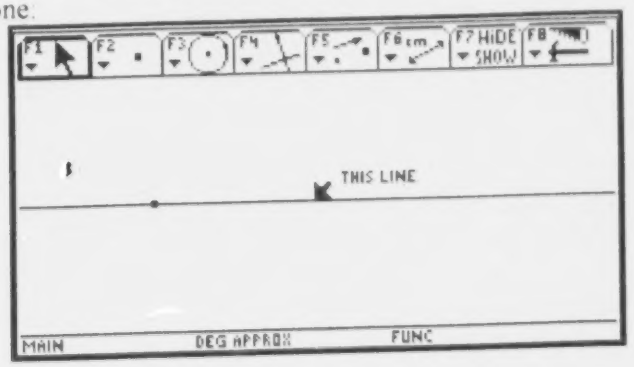
6 Open a new geometry session. Name the session "**ttr**". Make sure to place the session in your folder. Draw a triangle. Use the **Midpoint** tool (#3 under **F4**) to get the midpoint of the three sides of the triangle. Connect the midpoints with line segments. What type of geometry figure did you get?

Lesson 6
Section 7.7 - Angles and Lines

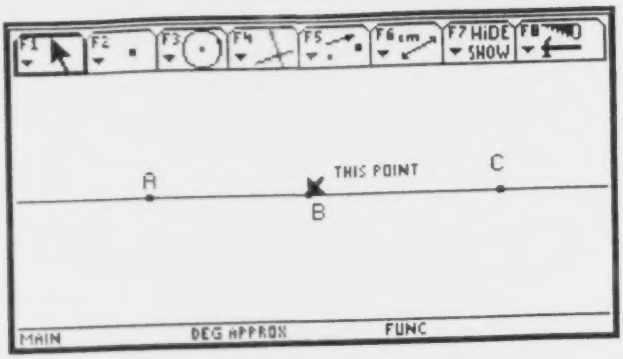
The following investigations supplement the discussions on pages 307, 308, and 309 of your textbook. Complete these activities after reading those pages. For each of these activities you will work in pairs. Your teacher will give you instructions on how to choose your partner. One person in the group will work with the calculator and the other will write the data in the recording table. You can alternate roles for the different activities if you wish. Therefore, before beginning these activities you need to shut off one of the calculators. Do not forget to go to the home screen before turning off the calculator. Follow the instructions carefully. If you do not understand the instructions, discuss the problem between the two of you first. Only after the two of you decide that you do not understand the instructions can you ask your teacher for help.

Part 1 - Linear Pairs

1. Start a new geometry session in your folder. If you do not remember how to start a new geometry session refer to the section, Starting a New Geometry Session Using Your New Folder, on page 18. Name this new session "**lps**"
2. Set the precision of calculator measurements to tenths. If you do not remember how to set the precision to tenths refer to the section, Setting the Precision of your TI-92 Calculator Measurements, on page 20.
2. Construct a horizontal line in the center of the TI-92 screen by selecting **F2** and pressing the number 4 to choose the **Line** tool. If you do not remember how to draw a line refer to the section, Drawing Parallel Lines, on page 37. You should now have a screen similar to the following one.

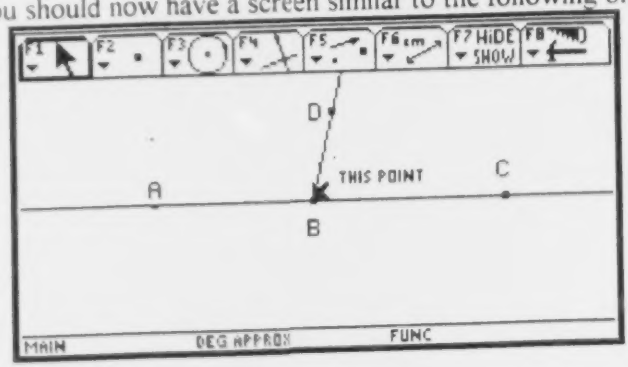


3. Place two additional points on the line by selecting **F2** and pressing the number 2 to choose the **Point on Object** tool. Move the screen cursor to the line. You should see the words "**ON THIS LINE**" on the screen. Press an **ENTER** key to define the point. Repeat this procedure to place the other point on the line. Make sure to place the points a good distance apart. Label the points A, B, and C by selecting **F7** and pressing the number 4 to choose the **Label** tool. Point B must be the middle point. If you do not remember how to label points refer to the section, Labeling Vertices of Triangle, on page 22. You should now have a screen similar to the following one.



4 Construct a ray with its endpoint at point B by selecting **F2** and pressing the number 6 to choose the **Ray** tool. Make sure the direction of the ray is towards the top of the TI-92 screen. If you do not remember how to draw a ray refer to the section, Drawing Rays for Angle, on page 27.

5 Place a point on the ray by selecting **F2** and pressing the number 2 to choose the **Point on Object** tool. Label this point D by selecting **F7** and pressing the number 4 to choose the **Label** tool. You should now have a screen similar to the following one:



6 Mark ∠ABD and ∠CBD by selecting **F7** and pressing the number 7 to choose the **Mark Angle** tool. Remember that three points must be defined in order to mark angles. To mark ∠ABD first position the screen cursor by point A. You should see "**THIS POINT**" on the screen. Press an **ENTER** key. Move the screen cursor to point B. You should see "**THIS POINT**" on the screen. Press an **ENTER** key. Move the screen cursor to point D. You should see "**THIS POINT**" on the screen. Press an **ENTER** key. A mark [∠] should appear on ∠ABD. Repeat this procedure to mark ∠CBD. You should now have a screen similar to the following one:

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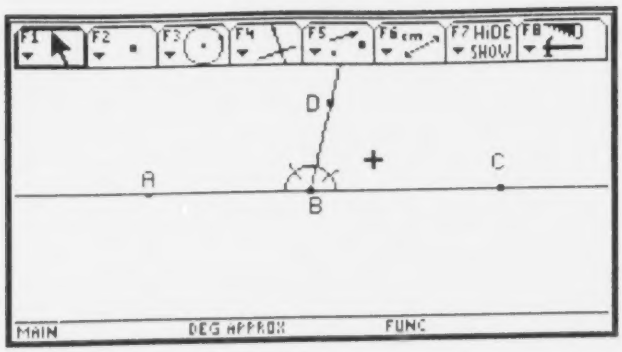


7 Find the measures of ∠ABD and ∠CBD by selecting **F6** and pressing the number 3 to choose the **Angle** measurement tool. If you do not remember how to measure a marked angle refer to the section, Measuring Angle, on page 29. Write down the measurements of ∠ABD and ∠CBD in the recording table for Linear Pairs.

8 Resize ∠ABD and ∠CBD by dragging ray BD. If you do not remember how to resize an angle refer to the section, Resizing Angle, on page 30. Write down five additional different angle measurements for ∠ABD and ∠CBD in the recording table for Linear Pairs below

9 Add the measurements of ∠ABD and ∠CBD together for each of the six different sets of measurements. What do you notice about this sum? Based on this result write a conclusion about the sum of two angles that are a linear pair.

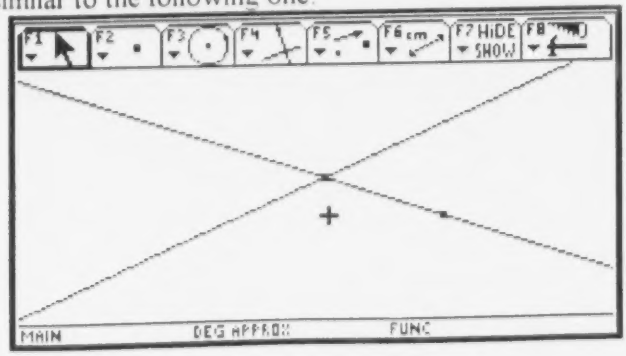
10 Return to the home screen when you have completed this activity.

Part 2 - Vertical Angles

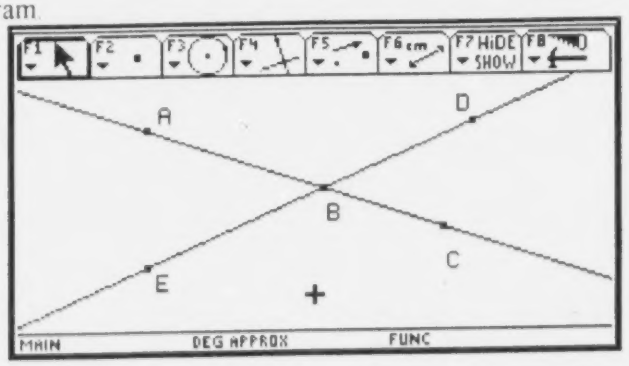
1 Start a new geometry session in your folder. If you do not remember how to start a new geometry session refer to the section, Starting a New Geometry Session Using Your New Folder, on page 18. Name this new session "**verang**".

2 Set the precision of the calculator measurement to tenths. If you do not remember how to set the precision to tenths refer to the section, Setting the Precision of your TI-92 Calculator Measurements, on page 20.

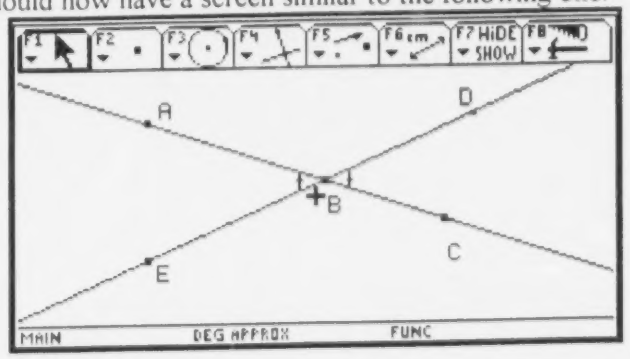
3 Construct two intersecting lines by selecting **F2** and pressing the number 4 to choose the **Line** tool. Try to angle the lines diagonally across the screen. If you do not remember how to draw a line refer to the section, Drawing Parallel Lines, on page 37. You should now have a screen similar to the following one:



3 Place points on each line on both sides of the intersection point by selecting **F2** and pressing the number 2 to choose the **Point on Object** tool. Move the screen cursor to one of the lines. You should see the words "**ON THIS LINE**" on the screen. Press an **ENTER** key to define the point. Repeat this procedure to place the other points on the lines. Make sure to place the points a good distance apart. When you are finished you should have a total of five points. Label the intersection point "B" by selecting **F7** and pressing the number 4 to choose the **Label** tool. If you do not remember how to label points refer to the section, Labeling Vertices of Triangle, on page 22. Label the other points as in the following diagram.



4 Mark ∠ABE and ∠CBD by selecting **F7** and pressing the number 7 to choose the **Mark Angle** tool. Remember that three points must be defined in order to mark angles. To mark ∠ABE first position the screen cursor by point A. You should see "**THIS POINT**" on the screen. Press an **ENTER** key. Move the screen cursor to point B. You should see "**THIS POINT**" or "**POINT AT THIS INTERSECTION**" on the screen. Press an **ENTER** key. Move the screen cursor to point E. You should see "**THIS POINT**" on the screen. Press an **ENTER** key. A mark [△] should appear on ∠ABE. Repeat this procedure to mark ∠CBD. You should now have a screen similar to the following one:



5 Find the measures of ∠ABE and ∠CBD by selecting **F6** and pressing the number 3 to choose the **Angle** measurement tool. If you do not remember how to measure a marked angle refer to the section, Measuring Angle, on page 29. Write down the measurements of ∠ABE and ∠CBD in the recording table for Vertical Angles.

6 Resize ∠ABE and ∠CBD by dragging line DE. If you do not remember how to resize an angle refer to the section, Resizing Angle, on page 30. Write down five additional different angle measurements for ∠ABE and ∠CBD in the recording table for Vertical Angles.

7 What do you notice about the measures of ∠ABE and ∠CBD?

8 Delete the marks on ∠ABE and ∠CBD. Delete the measures of ∠ABE and ∠CBD. If you do not remember how to delete parts of a geometry drawing refer to the section, Deletion of One Part of a Geometry Drawing, on page 15.

9 Repeat steps 4 to 7 but this time mark and measure ∠ABD and ∠EBC. Write down the measurements for ∠ABD and ∠EBC in the recording table for Vertical Angles.

10 ∠ABE and ∠CBD, and ∠ABD and ∠EBC are known as vertical angles. Based on this activity, what conclusion can you make about vertical angles?

11 Return to the home screen when you have completed this activity.

Part 3 - Perpendicular Lines

1 Start a new geometry session in your folder. If you do not remember how to start a new geometry session refer to the section, Starting a New Geometry Session Using Your New Folder, on page 18. Name this new session "**perlin**".

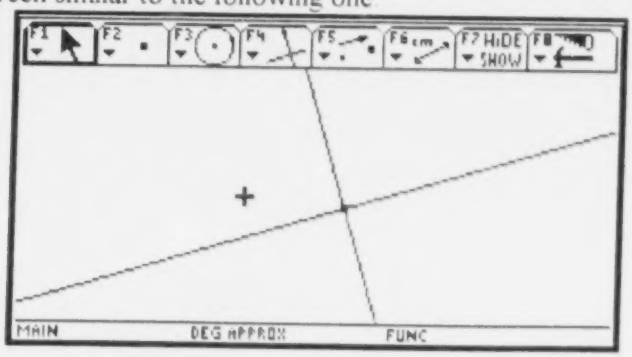
2 Construct a line in the center of the TI-92 screen by selecting **F2** and pressing the number 4 to choose the **Line** tool. If you do not remember how to draw a line refer to the section, Drawing Parallel Lines, on page 37.

3 You will construct a line perpendicular to the first line. To do this, press **F4** and press the number 1 to choose the **Perpendicular Line** tool.

4 Position the screen cursor on the point on the first line. You will see the words "**THRU THIS POINT**" on the screen.

5 Press an **ENTER** key. You will see the words "**PERPENDICULAR TO THIS LINE**" on the screen.

6 Press an **ENTER** key. The perpendicular line should appear on the screen. You should now have a screen similar to the following one.



7 Sketch this diagram in your mathematics notebook.

8 Press **F1**.

9 Press the number 1 to choose the **Pointer** tool.

10. Position the screen cursor on the first line. You should see the words "**THIS LINE**" on the screen.
11. Use the **HAND LOCK** key to drag the first line. Sketch four more diagrams of the perpendicular lines in your mathematics notebook.
12. Is there any conclusion you can make about the shape of perpendicular lines?
13. Return to the home screen when you have completed this activity.

Problems

Copy the geometry sessions, **anglin1** and **anglin2**, that are in the **MAIN** folder to your folder. Use properties of linear pairs and vertical angles to solve each of the following problems.

1. Open the geometry session "**anglin1**" that is in your folder. Calculate angle measures a, b, and c. Use the **Angle** measuring tool to check your answer.
2. Open the geometry session "**anglin2**"that is in your folder. Calculate angle measure x. Use the **Angle** measuring tool to check your answer.

Lesson 7
Section 7-8 - Angles and Parallel Lines

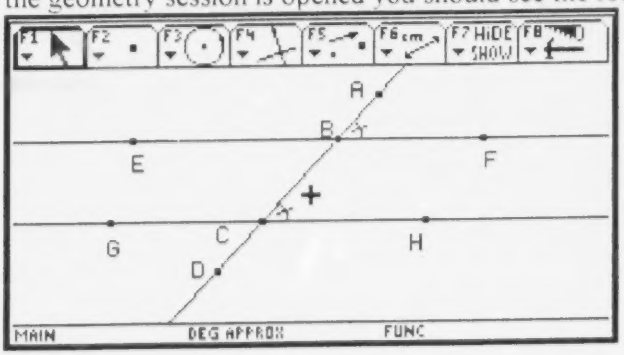
The following investigations supplement the discussions on pages 313 and 314 of your textbook. Complete these activities after reading those pages. For each of these activities you will work in pairs. Your teacher will give you instructions on how to choose your partner. One person in the group will work with the calculator and the other will write the data in the recording table. You can alternate roles for the different activities if you wish. Therefore, before beginning these activities you need to shut off one of the calculators. Do not forget to go to the home screen before turning off the calculator. Follow the instructions carefully. If you do not understand the instructions, discuss the problem between the two of you first. Only after the two of you decide that you do not understand the instructions can you ask your teacher for help.

Before beginning the activities delete the geometry sessions, **anglin1**, **anglin2**, **lps**, **perlin**, **verang**, and **ttr** from your folder. If you do not remember how to set delete geometry sessions refer to the section, Deletion of Geometry Sessions, on page 35. After deleting these geometry sessions, copy the geometry sessions, **corang1**, **corang2**, **corang3**, **corang4**, **aiang1**, and **aiang2**, that are in the **MAIN** folder to your folder. If you do not remember how to copy geometry sessions refer to the section, Copying a Geometry Session, on page 30.

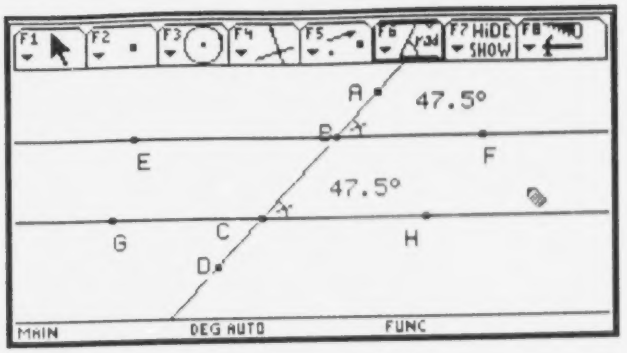
Part 1 - Corresponding Angles

Corresponding Angles ∠ABF and ∠BCH

1. Open the geometry session "**corang1**"that is in your folder. If you do not remember how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25. When the geometry session is opened you should see the following drawing:



2. ∠ABF and ∠BCH have already been marked for you. Measure ∠ABF and ∠BCH by selecting **F6** and pressing the number 3 to choose the **Angle** measurement tool. If you do not remember how to measure marked angles refer to the section, Measuring Angle, on page 29. Make sure to position the angle measures in appropriate positions. Your screen should now be similar to the following one:



3 Write the measures of ∠ABF and ∠BCH in the recording table for Corresponding Angles ∠ABF and ∠BCH (supplied by your teacher).

4 Press **F1**.

5 Press the number 1 to choose the **Pointer** tool.

6 Position the cursor on the transversal ABCD below point D. You should see the words "**THIS LINE**" on the screen.

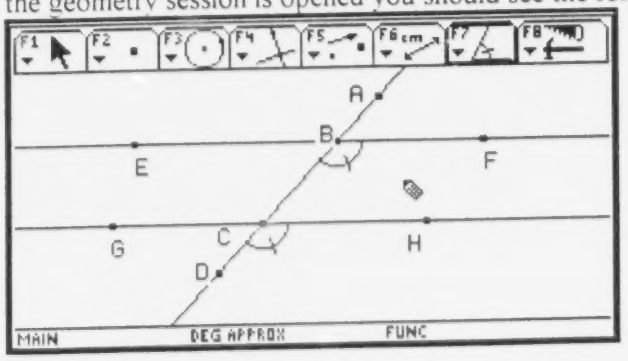
7 Use the **HAND LOCK** key to drag transversal ABCD. Write down four other measures for ∠ABF and ∠BCH in the recording table for Corresponding Angles ∠ABF and ∠BCH.

8 What is true about the measures of ∠ABF and ∠BCH?

9 Return to the home screen when you have completed this activity.

Corresponding Angles ∠FBC and ∠HCD

1 Open the geometry session "**corang2**"that is in your folder. If you do not remember how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25. When the geometry session is opened you should see the following drawing:



2 ∠FBC and ∠HCD have already been marked for you. Measure ∠FBC and ∠HCD by selecting **F6** and pressing the number 3 to choose the **Angle** measurement tool. If you do not remember how to measure marked angles refer to the section, Measuring Angle, on page 29. Make sure to position the angle measures in appropriate positions.

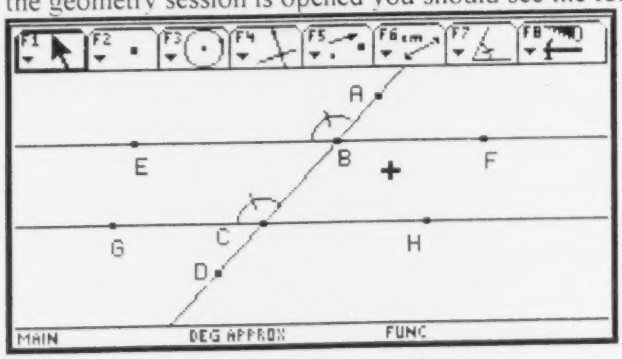
3 Write the measures of ∠FBC and ∠HCD in the recording table for Corresponding Angles ∠FBC and ∠HCD (supplied by your teacher).

4 Press **F1**

5. Press the number 1 to choose the **Pointer** tool.
6. Position the cursor on the transversal ABCD below point D. You should see the words "**THIS LINE**" on the screen.
7. Use the **HAND LOCK** key to drag transversal ABCD. Write down four other measures for ∠FBC and ∠HCD in the recording table for Corresponding Angles ∠FBC and ∠HCD
8. What is true about the measures of ∠FBC and ∠HCD?
9. Return to the home screen when you have completed this activity.

Corresponding Angles ∠ABE and ∠BCG

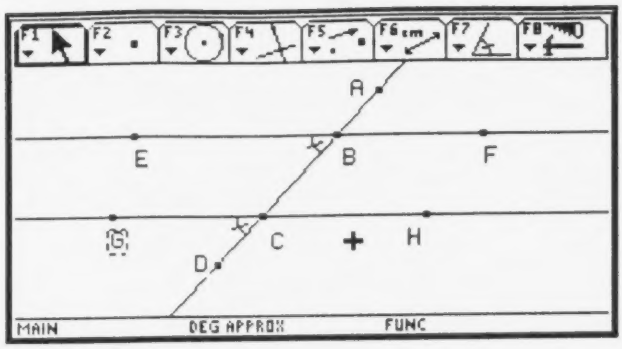
1. Open the geometry session "**corang3**"that is in your folder. If you do not remember how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25. When the geometry session is opened you should see the following drawing:



2. ∠ABE and ∠BCG have already been marked for you. Measure ∠ABE and ∠BCG by selecting **F6** and pressing the number 3 to choose the **Angle** measurement tool. If you do not remember how to measure marked angles refer to the section, Measuring Angle, on page 29. Make sure to position the angle measures in appropriate positions.
3. Write the measures of ∠ABE and ∠BCG in the recording table for Corresponding Angles ∠ABE and ∠BCG (supplied by your teacher).
4. Press **F1**.
5. Press the number 1 to choose the **Pointer** tool.
6. Position the cursor on the transversal ABCD below point D. You should see the words "**THIS LINE**" on the screen.
7. Use the **HAND LOCK** key to drag transversal ABCD. Write down four other measures for ∠ABE and ∠BCG in the recording table for Corresponding Angles ∠ABE and ∠BCG.
8. What is true about the measures of ∠ABE and ∠BCG?
9. Return to the home screen when you have completed this activity.

Corresponding Angles ∠EBC and ∠GCD

1. Open the geometry session "**corang4**"that is in your folder. If you do not remember how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25. When the geometry session is opened you should see the following drawing:

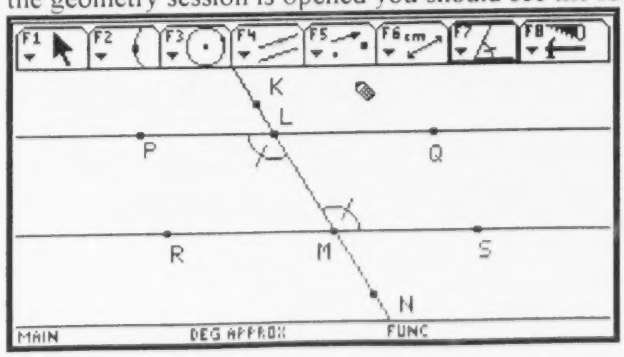


2. ∠EBC and ∠GCD have already been marked for you. Measure ∠EBC and ∠GCD by selecting **F6** and pressing the number 3 to choose the **Angle** measurement tool. If you do not remember how to measure marked angles refer to the section, Measuring Angle, on page 29. Make sure to position the angle measures in appropriate positions.
3. Write the measures of ∠EBC and ∠GCD in the recording table for Corresponding Angles ∠EBC and ∠GCD (supplied by your teacher).
4. Press **F1**
5. Press the number 1 to choose the **Pointer** tool.
6. Position the cursor on the transversal ABCD below point D. You should see the words "**THIS LINE**" on the screen.
7. Use the **HAND LOCK** key to drag transversal ABCD. Write down four other measures for ∠EBC and ∠GCD in the recording table for Corresponding Angles ∠EBC and ∠GCD.
8. What is true about the measures of ∠EBC and ∠GCD?
9. What conclusion can you make about corresponding angles based on the results for the sets of corresponding angles, ∠ABF and ∠BCH, ∠FBC and ∠HCD, ∠ABE and ∠BCG, and ∠EBC and ∠GCD?
10. Return to the home screen when you have completed this activity.

Part 2 - Alternate Interior Angles

Alternate Interior Angles ∠PLM and ∠LMS

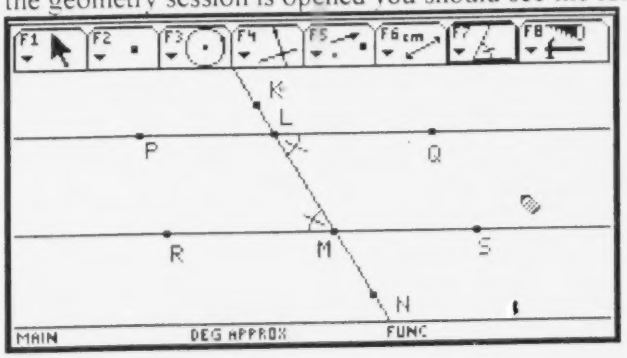
1. Open the geometry session "**aiang1**"that is in your folder. If you do not remember how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25. When the geometry session is opened you should see the following drawing:



2. ∠PLM and ∠LMS have already been marked for you. Measure ∠PLM and ∠LMS by selecting **F6** and pressing the number 3 to choose the **Angle** measurement tool. If you do not remember how to measure marked angles refer to the section, Measuring Angle, on page 29. Make sure to position the angle measures in appropriate positions.
3. Write the measures of ∠PLM and ∠LMS in the recording table for Alternate Interior Angles ∠PLM and ∠LMS (supplied by your teacher).
4. Press **F1**.
5. Press the number 1 to choose the **Pointer** tool.
6. Position the cursor on the transversal KLMN below point N. You should see the words "**THIS LINE**" on the screen.
7. Use the **HAND LOCK** key to drag transversal KLMN. Write down four other measures for ∠PLM and ∠LMS in the recording table for Alternate Interior Angles ∠PLM and ∠LMS.
8. What is true about the measures of ∠PLM and ∠LMS?
9. Return to the home screen when you have completed this activity.

Alternate Interior Angles ∠QLM and ∠LMR

1. Open the geometry session "**aiang2**"that is in your folder. If you do not remember how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25. When the geometry session is opened you should see the following drawing:



2. ∠QLM and ∠LMR have already been marked for you. Measure ∠QLM and ∠LMR by selecting **F6** and pressing the number 3 to choose the **Angle** measurement tool. If you do not remember how to measure marked angles refer to the section, Measuring Angle, on page 29. Make sure to position the angle measures in appropriate positions.
3. Write the measures of ∠QLM and ∠LMR in the recording table for Alternate Interior Angles ∠QLM and ∠LMR (supplied by your teacher).
4. Press **F1**.
5. Press the number 1 to choose the **Pointer** tool.
6. Position the cursor on the transversal KLMN below point N. You should see the words "**THIS LINE**" on the screen.
7. Use the **HAND LOCK** key to drag transversal KLMN. Write down four other measures for ∠QLM and ∠LMR in the recording table for Alternate Interior Angles ∠QLM and ∠LMR.

8 What is true about the measures of ∠QLM and ∠LMR?

9 What conclusion can you make about alternate interior angles based on the results for the sets of alternate interior angles ∠PLM and ∠LMS, and ∠QLM and ∠LMR?

10 Return to the home screen when you have completed this activity.

Problems

Copy the geometry sessions, **coralt1** and **coralt2**, that are in the **MAIN** folder to your folder. Use properties of corresponding angles and alternate interior angles to solve each of the following problems.

1 Open the geometry session "**coralt1**"that is in your folder. Calculate the angle measures a, b, c, d, e, f, and g. Use the **Angle** measuring tool to check your answer.

2 Open the geometry session "**coralt2**"that is in your folder. Calculate the angle measures a, b, c, d, and e. Use the **Angle** measuring tool to check your answer.

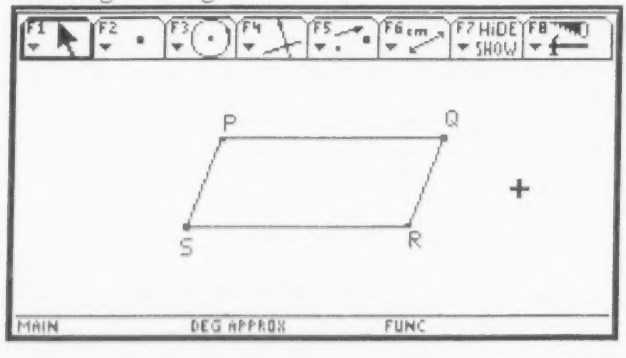
Lesson 8
Section 7-9 - Special Quadrilaterals

The following investigations supplement the discussions on pages 318 and 319 of your textbook. Complete these activities after reading those pages. For each of these activities you will work in pairs. Your teacher will give you instructions on how to choose your partner. One person in the group will work with the calculator and the other will write the data in the recording table. You can alternate roles for the different activities if you wish. Therefore, before beginning these activities you need to shut off one of the calculators. Do not forget to go to the home screen before turning off the calculator. Follow the instructions carefully. If you do not understand the instructions, discuss the problem between the two of you first. Only after the two of you decide that you do not understand the instructions can you ask your teacher for help.

Delete the geometry sessions **corang1**, **corang2**, **corang3**, **corang4**, **aiang1**, **aiang2**, **coralt1**, and **coralt2** that are in your folder. If you do not remember how to delete geometry sessions refer to the section, Deletion of Geometry Session, on page 35. Copy the geometry sessions, **parpor**, **parpor1**, **rhompor**, **rhompor1**, **rectpor**, and **rectpor1** that are in the **MAIN** folder to your folder. If you do not remember how to copy geometry sessions refer to the section, Copying a Geometry Session, on page 30.

Part 1 - Properties of a Parallelogram

1. Open the geometry session "**parpor**"that is in your folder. If you do not remember how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25. When the geometry session is opened you should see parallelogram PQRS as pictured in the following drawing:



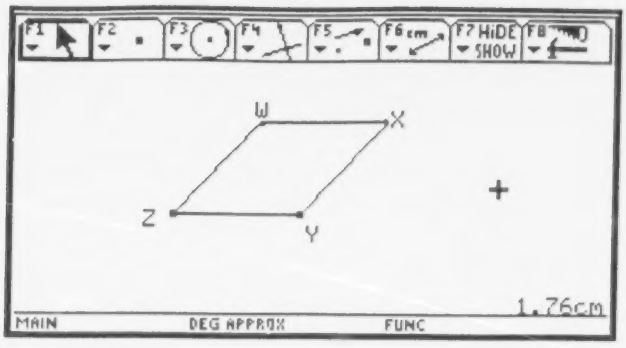
2. Measure the length of sides PQ, QR, RS, and PS by selecting **F6** and pressing the number 1 to choose the **Distance and Length** tool. Remember to position the lengths of the sides in the exterior of parallelogram PQRS. If you do not remember how to measure the lengths of sides of a polygon refer to the section, Using the Measuring Tool to Measure the Sides of Triangle ABC, on page 23. Write down the lengths of sides PQ, QR, RS, and PS in the recording table for Properties of a Parallelogram (supplied by your teacher).
3. Press **F1**.
4. Press the number 1 to choose the **Pointer** tool.
5. Position the cursor at point P of parallelogram PQRS. You should see the words "**THIS POINT**" on the screen. Use the **HAND LOCK** key to drag vertex P. Record three

additional sets of measurements of sides PQ, QR, RS, and PS of parallelogram PQRS in the recording table for Properties of a Parallelogram.

6. Position the cursor at point Q of parallelogram PQRS. You should see the words "**THIS POINT**" on the screen. Use the **HAND LOCK** key to drag vertex Q. Record three additional set of measurements of sides PQ, QR, RS, and PS of parallelogram PQRS in the recording table for Properties of a Parallelogram.
7. From the measurements in the recording tables, what conclusions can you make about the relationship between the sides of a parallelogram?
8. Open the geometry session "**parpor1**"that is in your folder. If you do not remember how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25. ∠SPQ, ∠PQR, ∠QRS, and ∠PSR of parallelogram PQRS have been marked for you.
9. Measure ∠SPQ, ∠PQR, ∠QRS, and ∠PSR of parallelogram PQRS by selecting **F6** and pressing the number 3 to choose the **Angle** measuring tool. Make sure to position the measures of ∠SPQ, ∠PQR, ∠QRS, and ∠PSR in the interior of parallelogram PQRS. If you do not remember how to measure angles of polygons refer to the sections, Measuring ∠PQR and Repositioning the Measure of ∠PQR, on page 33. Write down the measures of ∠SPQ, ∠PQR, ∠QRS, and ∠PSR in the recording table for Properties of a Parallelogram.
10. Press **F1**.
11. Press the number 1 to choose the **Pointer** tool.
12. Position the cursor at point P of parallelogram PQRS. You should see the words "**THIS POINT**" on the screen. Use the **HAND LOCK** key to drag vertex P. Record three additional sets of measurements for angles ∠SPQ, ∠PQR, ∠QRS, and ∠PSR of parallelogram PQRS in the recording table for Properties of a Parallelogram.
13. Position the cursor at point Q of parallelogram PQRS. You should see the words "**THIS POINT**" on the screen. Use the **HAND LOCK** key to drag vertex Q. Record three additional set of measurements for angles ∠SPQ, ∠PQR, ∠QRS, and ∠PSR of parallelogram PQRS in the recording table for Properties of a Parallelogram.
14. From the measurements in the recording tables, what conclusions can you make about the relationship between the angles of a parallelogram?
15. Return to the home screen when you have completed this activity.

Part 2 - Properties of a Rhombus

1. Open the geometry session "**rhompor**"that is in your folder. If you do not remember how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25. When the geometry session is opened, you should see rhombus WXYZ as pictured in the following drawing:

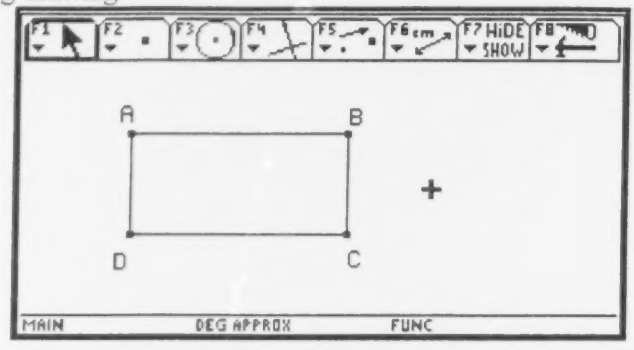


2. Measure the length of sides WX, XY, YZ, and WZ by selecting **F6** and pressing the number 1 to choose the **Distance and Length** tool. Remember to position the lengths of the sides in the exterior of rhombus PQRS. If you do not remember how to measure the lengths of sides of a polygon refer to the section, Using the Measuring Tool to Measure the Sides of Triangle ABC, on page 23. Write down the lengths of sides WX, XY, YZ, and WZ in the recording table for Properties of a Rhombus (supplied by your teacher).
3. Press **F1**.
4. Press the number 1 to choose the **Pointer** tool.
5. Position the cursor at point Y of rhombus WXYZ. You should see the words "**THIS POINT**" on the screen. Use the **HAND LOCK** key to drag vertex Y. Record five additional set of measurements of sides WX, XY, YZ, and WZ of rhombus WXYZ in the recording table for Properties of a Rhombus.
6. From the measurements in the recording tables what conclusions can you make about the relationship between the sides of a rhombus?
7. Open the geometry session "**rhompor1**"that is in your folder. If you do not remember how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25. ∠ZWX, ∠WXY, ∠XYZ, and ∠YZW of parallelogram WXYZ have already been marked for you.
8. Measure ∠ZWX, ∠WXY, ∠XYZ, and ∠YZW of rhombus WXYZ by selecting **F6** and pressing the number 3 to choose the **Angle** measuring tool. Make sure to position the measures of ∠ZWX, ∠WXY, ∠XYZ, and ∠YZW in the interior of rhombus WXYZ. If you do not remember how to measure angles of polygons refer to the sections, Measuring ∠PQR and Repositioning the Measure of ∠PQR, on page 33. Write down the measures of ∠ZWX, ∠WXY, ∠XYZ, and ∠YZW in the recording table for Properties of a Rhombus.
9. Press **F1**.
10. Press the number 1 to choose the **Pointer** tool.
11. Position the cursor at point Y of rhombus WXYZ. You should see the words "**THIS POINT**" on the screen. Use the **HAND LOCK** key to drag vertex Y. Record five additional set of measurements of angles ∠ZWX, ∠WXY, ∠XYZ, and ∠YZW of rhombus WXYZ in the recording table for Properties of a Rhombus.
12. From the measurements in the recording tables what conclusions can you make about the relationship between the angles of a rhombus?

13. Return to the home screen when you have completed this activity.

Part 3 - Properties of a Rectangle

1. Open the geometry session "**rectpor**"that is in your folder. If you do not remember how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25. When the geometry session is opened you should see rectangle ABCD as pictured in the following drawing:



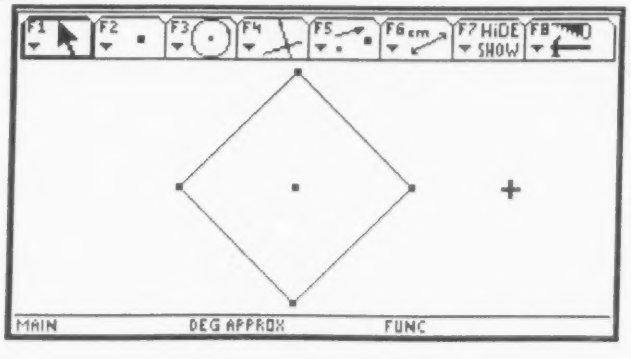
2. Measure the length of sides AB, BC, CD, and AD by selecting **F6** and pressing the number 1 to choose the **Distance and Length** tool. Remember to position the lengths of the sides in the exterior of rectangle ABCD. If you do not remember how to measure the lengths of the sides of a polygon refer to the section, Using the Measuring Tool to Measure the Sides of Triangle ABC, on page 23. Write down the lengths of sides AB, BC, CD, and AD in the recording table for Properties of a Rectangle (supplied by your teacher).
3. Press **F1**.
4. Press the number 1 to choose the **Pointer** tool.
5. Position the cursor at point A of rectangle ABCD. You should see the words "**THIS POINT**" on the screen. Use the **HAND LOCK** key to drag vertex A. Record three additional sets of measurements of sides AB, BC, CD, and AD of rectangle ABCD in the recording table Properties of a Rectangle.
6. Position the cursor at point B of rectangle ABCD. You should see the words "**THIS POINT**" on the screen. Use the **HAND LOCK** key to drag vertex B. Record three additional sets of measurements of sides AB, BC, CD, and AD of rectangle ABCD in the recording table for Properties of a Rectangle.
7. From the measurements in the recording table what conclusions can you make about the relationship between the sides of a rectangle?
8. Open the geometry session "**rectpor2**"that is in your folder. If you do not remember how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25. ∠DAB, ∠ABC, ∠BCD, and ∠CDA of rectangle ABCD have already been marked for you.
9. Measure ∠DAB, ∠ABC, ∠BCD, and ∠CDA of rectangle ABCD by selecting **F6** and pressing the number 3 to choose the **Angle** measuring tool. Make sure to position the measures of ∠DAB, ∠ABC, ∠BCD, and ∠CDA in the interior of rectangle ABCD. If you

do not remember how to measure angles of polygons refer to the sections, Measuring ∠PQR and Repositioning the Measure of ∠PQR, on page 33. Write down the measures of ∠DAB, ∠ABC, ∠BCD, and ∠CDA in the recording table for Properties of a Rectangle.

10. Press **F1**.
11. Press the number 1 to choose the **Pointer** tool.
12. Position the cursor at point A of rectangle ABCD. You should see the words "**THIS POINT**" on the screen. Use the **HAND LOCK** key to drag vertex A. Record three additional sets of measurements of angles ∠DAB, ∠ABC, ∠BCD, and ∠CDA of rectangle ABCD in the recording table Properties of a Rectangle.
13. Position the cursor at point B of rectangle ABCD. You should see the words "**THIS POINT**" on the screen. Use the **HAND LOCK** key to drag vertex B. Record three additional sets of measurements of angles ∠DAB, ∠ABC, ∠BCD, and ∠CDA of rectangle ABCD in the recording table for Properties of a Rectangle.
14. From the measurements in the recording table what conclusions can you make about the relationship between the angles of a rectangle?
15. Return to the home screen when you have completed this activity.

Part 4 - Properties of a Square

1. To draw a square you will use the regular polygon tool under **F3** in the geometry application. Start a new geometry session in your folder. Name this new session "**sqpor**". If you do not remember how to start a new geometry session refer to the section, Starting a New Geometry Session Using Your New Folder, on page 18.
2. Press **F3**.
3. Press the number 5 to choose the **Regular Polygon** tool.
4. Position the screen cursor in the middle of the screen.
5. Press an **ENTER** key.
6. Use the cursor pad to move the screen cursor. You should see a dotted circle.
7. Press an **ENTER** key. You should see a number by the center.
8. Use the cursor pad to move the screen cursor until the number by the center changes to a 4.
9. Press an **ENTER** key. A square appears on the screen. You should have a screen similar to the following one:



10. Label the vertices of the square G, H, I, and J. Make sure to position the labels in the exterior of square GHIJ. If you do not remember how to label the vertices of a polygon refer to the section, Labeling Vertices of Triangle, on page 22.
11. Return to the home screen. Make a copy of **sqpor** and place it in the main folder. Rename **sqpor** in the main folder "**sqpor1**". Move **sqpor1** from the main folder to your folder. If you do not remember how to copy a geometry session refer to the section, Making a Copy of a Geometry Session, on page 40.
12. Open the geometry session **sqpor** that is in your folder. Measure the length of sides GH, HI, IJ, and GJ by selecting **F6** and pressing the number 1 to choose the **Distance and Length** tool. Remember to position the lengths of the sides in the exterior of square GHIJ. If you do not remember how to measure the lengths of sides of a polygon refer to the section, Using the Measuring Tool to Measure the Sides of Triangle ABC, on page 23. Write down the lengths of sides GH, HI, IJ, and GJ in the recording table for Properties of a Square (supplied by your teacher).
13. Press **F1**.
14. Press the number 1 to choose the **Pointer** tool.
15. Position the cursor at point G of square GHIJ. You should see the words "**THIS POINT**" on the screen. Use the **HAND LOCK** key to drag vertex G. Record five additional sets of measurements of sides GH, HI, IJ, and GJ of square GHIJ in the recording table for Properties of a Square.
16. From the measurements in the recording table what conclusions can you make about the relationship between the sides of a square?
17. Open the geometry session **sqpor1** that is in your folder. Mark ∠JGH, ∠GHI, ∠HIJ, and ∠IJG of square GHIJ by selecting **F7** and pressing the number 7 to choose the **Mark Angle** tool. If you do not remember how to mark angles of a polygon refer to the section, Marking ∠PQR, on page 32.
18. Measure ∠JGH, ∠GHI, ∠HIJ, and ∠IJG of square GHIJ by selecting **F6** and pressing the number 3 to choose the **Angle** measuring tool. Make sure to position the measures of ∠JGH, ∠GHI, ∠HIJ, and ∠IJG in the interior of square GHIJ. If you do not remember how to measure angles of polygons refer to the sections, Measuring ∠PQR and Repositioning the Measure of ∠PQR, on page 33. Write down the measures of ∠JGH, ∠GHI, ∠HIJ, and ∠IJG in the recording table for Properties of a Square.
19. Press **F1**.
20. Press the number 1 to choose the **Pointer** tool.
21. Position the cursor at point G of square GHIJ. You should see the words "**THIS POINT**" on the screen. Use the **HAND LOCK** key to drag vertex G. Record five additional sets of measurements of angles ∠JGH, ∠GHI, ∠HIJ, and ∠IJG of square GHIJ in the recording table for Properties of a Square.
22. From the measurements in the recording table what conclusions can you make about the relationship between the angles of a square?
23. Return to the home screen when you have completed this activity.

Lesson 9
Section 7-8 - The Triangle Sum Property

The following investigation supplements the discussions on pages 322, 323, and 324 of your textbook. Complete this activity after reading those pages. For this activity you will work in pairs. Your teacher will give you instructions on how to choose your partner. One person in the group will work with the calculator and the other will write the data in the recording table. Therefore, before beginning these activities you need to shut off one of the calculators. Do not forget to go to the home screen before turning off the calculator. Follow the instructions carefully. If you do not understand the instructions, discuss the problem between the two of you first. Only after the two of you decide that you do not understand the instructions can you ask your teacher for help.

Delete the geometry sessions **parpor**, **parpor1**, **rhompor**, **rhompor1**, **rectpor**, **rectpor1**, **sqpor**, and **sqpor1** that are in your folder. If you do not remember how to delete geometry sessions refer to the section, Deletion of Geometry Session, on page 35.

Triangle Sum Property

1. Start a new geometry session in your folder. If you do not remember how to start a new geometry session refer to the section, Starting a New Geometry Session Using Your New Folder, on page 18. Name this new session "**sumtri**".
2. Set the precision of the calculator measurement to tenths. If you do not remember how to set the precision to tenths refer to the section, Setting the Precision of your TI-92 Calculator Measurements, on page 20.
3. Construct a triangle by selecting **F3** and pressing the number 3 to choose the **Triangle** tool. If you do not remember how to draw a triangle refer to the section, Drawing a Triangle, on page 10.
4. Label the vertices of the triangle A, B, and C by selecting **F7** and pressing the number 4 to choose the **Label** tool. If you do not remember how to label vertices of a triangle refer to the section, Labeling Vertices of Triangle, on page 22.
5. Mark $\angle ABC$, $\angle ACB$, and $\angle BAC$ of $\triangle ABC$ by selecting **F7** and pressing the number 7 to choose the **Mark Angle** tool. If you do not remember how to mark angles of a triangle refer to the section, Marking $\angle PQR$, on page 32.
6. Find the measurements of $\angle ABC$, $\angle ACB$, and $\angle BAC$ of $\triangle ABC$ by selecting **F6** and pressing the number 3 to choose the **Angle** measurement tool. If you do not remember how to measure angles of a triangle refer to the sections, Measuring $\angle PQR$ and Repositioning the Measure of $\angle PQR$, on page 33. Write down the measures of $\angle ABC$, $\angle ACB$, and $\angle BAC$ of $\triangle ABC$ in the recording table for the Triangle Sum Property (supplied by your teacher).
7. Press **F1**.
8. Press the number 1 to select the **Pointer** tool.
9. Position the screen cursor at vertex A. Use the **HAND LOCK** tool to drag vertex A. Write down five additional sets of measures for $\angle ABC$, $\angle ACB$, and $\angle BAC$ of $\triangle ABC$ in the recording table for Triangle Sum Property.
10. Sum the measures of $\angle ABC$, $\angle ACB$, and $\angle BAC$ of $\triangle ABC$ for each different set of measurements.

11. Based on this activity what conclusion can you make about the sum of the measures of the three angles of a triangle?

Problems

Copy the geometry sessions, **trsum1**, **trsum2** and **trsum3**, that are in the **MAIN** folder to your folder. Use triangle sum property to solve each of the following problems:

1. Open the geometry session "**trsum1**"that is in your folder. Calculate the measure of ∠BAC in △ABC. Use the **Angle** measuring tool to check your answer.
2. Open the geometry session "**trsum2**"that is in your folder. Calculate the measure of ∠PRS. Use the **Angle** measuring tool to check your answer.
3. Open the geometry session "**trsum3**"that is in your folder. Calculate the measures of ∠BAC, ∠DBC, ∠BEA, ∠BEC, ∠CED, and ∠CDB. Use the **Angle** measuring tool to check your answer.

Lesson 10
Section 13-1 - Area of a Right Triangle

The following problems should be completed after you have read the discussions on pages 568 and 569 of your textbook. You will work individually on these problems.

Problems

1. Delete the geometry sessions **sumtri**, **trsum1**, **trsum2**, and **trsum3** that are in your folder.
2. Copy the geometry sessions, **rtpr1**, **rtpr2**, **rtpr3**, **rtpr4**, and **rtpr5**, that are in the **MAIN** folder to your folder. If you do not remember how to copy geometry sessions refer to the section, Copying a Geometry Session, on page 30.
3. Open the geometry session "**rtpr1**"that is in your folder. If you do not remember how to open a geometry session refer to the section, Opening a Previous Geometry Session, on page 25. When the geometry session is opened you should see right triangle ABC. Each side of △ABC has been measured for you. Calculate the area of △ABC. You can check your answer by pressing **F6** and then pressing the number 2 to choose the **Area** measurement tool. Move the screen cursor to any side of the triangle and you will see the words "**THIS TRIANGLE**" on the screen. Press an **ENTER** key and you will see the area of △ABC.
4. Open the geometry session "**rtpr2**"that is in your folder. Use the **Distance and Length** measuring tool to measure the lengths of the two legs of triangle PQR. If you do not remember how to measure the length of a side of a triangle refer to the section, Using the Measuring Tool to Measure the Sides of Triangle ABC, on page 23. Calculate the area of △PQR. Use the **Area** measuring tool to check your answer.
5. Open the geometry session "**rtpr3**"that is in your folder. Use the **Area** measuring tool to find the area of triangle XYZ. Use the **Distance and Length** measuring tool to measure the length of leg XY of △XYZ. Calculate the length of leg YZ of △XYZ. Use the **Distance and Length** measuring tool to check your answer.
6. Open the geometry session "**rtpr4**"that is in your folder. Use the measuring tools to help you calculate the area of quadrilateral ABDE. The answer is in the dotted box below the comment "The area of quadrilateral ABDE is". Press **F7** and then the number 1 to choose the Hide/Show tool. Position the screen cursor by the dotted box. You should see the words "**THIS TEXT**" on the screen. Press an **ENTER** key. The answer will appear on the screen.
7. Open the geometry session "**rtpr5**"that is in your folder. Use the measuring tools to help you calculate the area of hexagon ABLCDN. The answer is in the dotted box below the comment "The area of hexagon ABLCDN is". Press **F7** and then the number 1 to choose the Hide/Show tool. Position the screen cursor by the dotted box. You should see the words "**THIS TEXT**" on the screen. Press an **ENTER** key. The answer will appear on the screen.
8. Your teacher may ask you to make up some area of right triangle problems for another student in the class. Your teacher will give you instructions on how to choose your partner and the number of problems to make up. If your teacher asks you to do this, then draw diagrams containing right triangles on your TI-92 calculator. Start with an easy problem

and continually make the problems more difficult. Write instructions for each problem so that the other student will understand what he/she has to do in order to solve the problem. If you wish you can use the **Hide/Show** tool under **F7** to display the answers. Solve the problem yourself first to make sure that the problem is solvable. When both of you have your problems ready exchange your calculators and try to solve the right triangle problems.

TI-92 Investigative Problem

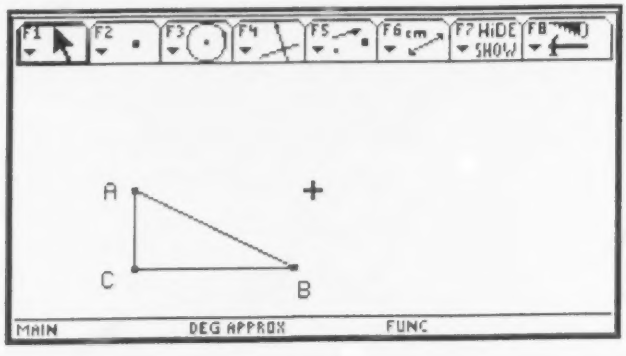
Use the TI-92 to investigate what happens to the area of a right triangle when the length of one of the legs of the right triangle doubles.

Lesson 11
Section 13-3 - The Pythagorean Theorem

The following investigation supplements the discussions on pages 578, 579, and 580 of your textbook. Complete this activity after reading those pages. For this activity you will work in pairs. Your teacher will give you instructions on how to choose your partner. One person in the group will work with the calculator and the other will write the data in the recording table. Therefore, before beginning this activity you need to shut off one of the calculators. Do not forget to go to the home screen before turning off the calculator. Follow the instructions carefully. If you do not understand the instructions, discuss the problem between the two of you first. Only after the two of you decide that you do not understand the instructions can you ask your teacher for help.

Pythagorean Theorem

1. Copy the geometry session "**pytth**" that is in the **MAIN** folder to your folder. If you do not remember how to copy geometry sessions refer to the section, Copying a Geometry Session, on page 30.
2. Open the geometry session "**pytth**"that is in your folder. If you do not remember how to open a geometry session that is in your folder refer to the section, Opening a Previous Geometry Session, on page 25. When the geometry session is opened you should see right triangle ABC. Notice that the right angle is ∠ACB. You should have a screen like the following one:



3. Use the **Distance and Length** measuring tool to measure the lengths of sides AB, BC, and AC. If you do not remember how to measure lengths of sides of a triangle refer to the section, Using the Measuring Tool to Measure the Sides of Triangle ABC, on page 23. Write these measurements in the recording table for Pythagorean Theorem (supplied by your teacher).
4. Use the pointer tool to drag point B. Record three additional measurements for sides AB, BC, and AC in the recording table for Pythagorean Theorem.
5. Use the pointer tool to drag point C. Record three additional measurements for sides AB, BC, and AC in the recording table for Pythagorean Theorem. You should now have seven sets of measurements for sides AB, BC, and AC.
6. Complete the columns for $(AB)^2$, $(BC)^2$, and $(AC)^2$. Round off your answers to the nearest tenth of a cm^2.

7. What relationship appears to be true for $(AB)^2$, $(BC)^2$, and $(AC)^2$?

Problems

Delete the geometry sessions, **rtpr1**, **rtpr2**, **rtpr3**, **rtpr4**, and **rtpr5** that are in your folder. Copy the geometry sessions, **ptpr1**, **ptpr2**, and **ptpr3**, that are in the **MAIN** folder to your folder. Use the Pythagorean Theorem to solve each of the following problems. Express all answers to the nearest tenth of a centimeter.

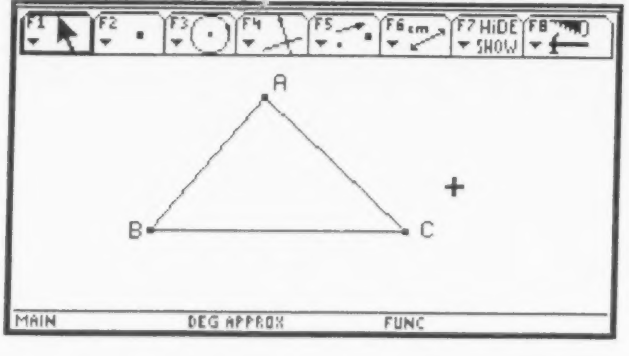
1. Open the geometry session "**ptpr1**"that is in your folder. Calculate the length of side AB. Use the **Distance and Length** measuring tool to check your answer.
2. Open the geometry session "**ptpr2**"that is in your folder. Calculate the length of side BC. Use the **Distance and Length** measuring tool to check your answer.
3. Open the geometry session "**ptpr3**"that is in your folder. Calculate the length of diagonal PR. Use the **Distance and Length** measuring tool to check your answer.
4. Start a new geometry session and name it "**ptsq**".Use the **Regular Polygon** tool to draw a square. Use the **Distance and Length** measuring tool to measure one side of the square. Calculate the length of the diagonal of the square. Use the **Distance and Length** measuring tool to check your answer.

Lesson 12
Section 13-4 - Area of Any Triangle

The following investigation supplements the discussions on pages 584, 585, and 586 of your textbook. Complete this activity after reading those pages. For this activity you will workin pairs. Your teacher will give you instructions on how to choose your partner. One person in the group will work with the calculator and the other will write the data in the recording table. Therefore, before beginning this activity you need to shut off one of the calculators. Do not forget to go to the home screen before turning off the calculator. Follow the instructions carefully. If you do not understand the instructions, discuss the problem between the two of you first. Only after the two of you decide that you do not understand the instructions can you ask your teacher for help.

Heights and Areas of Triangles

1. Open a new geometry session in your folder. Name the new geometry session "**trhe**". If you do not remember how to open a new geometry session in your folder refer to the section, Starting a New Geometry Session Using Your New Folder, on page 18.
2. Set the precision of the calculator measurement to tenths. If you do not remember how to set the precision to tenths refer to the section, Setting the Precision of your TI-92 Calculator Measurements, on page 20.
3. Use the **Triangle** tool to draw a triangle (not a right triangle). If you do not remember how to draw a triangle refer to the section, Drawing a Triangle, on page 10.
4. Use the **Label** tool to label the vertices of the triangle A, B, and C. Place vertex A at the top vertex, make B the bottom vertex on the left, and C the bottom vertex on the right. If you do not remember how to label vertices of a triangle refer to the section, Labeling Vertices of Triangle, on page 22. You should have a screen similar to the following one:



5. Return to the home screen. Make a copy of **trhe** and place it in the main folder. Rename **trhe** in the main folder "**trhe1**". Move **trhe1** from the main folder to your folder. If you do not remember how to copy a geometry session refer to the section, Making a Copy of a Geometry Session, on page 40.
6. Repeat step 6 to make a new copy of **trhe**. Name the new copy **trhe2** and place it in your folder.
7. Open the geometry session **trhe** that is in your folder. Use the **Distance and Length** measuring tool to measure the length of side BC of $\triangle ABC$. Write this value in the recording

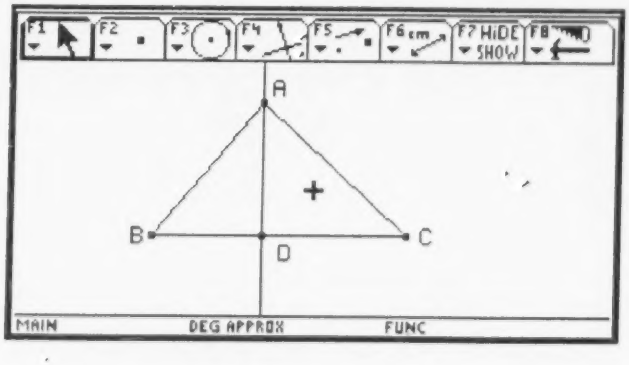
sheet for Heights and Areas of Triangles. If you do not remember how to measure the lengths of the sides of a triangle refer to the section, Using the Measuring Tool to Measure the Sides of Triangle ABC, on page 23.

8. You will now draw an altitude from vertex A to side BC of ▵ABC. Press **F4**. Press the number 1 to choose the **Perpendicular Line** tool. Move the screen cursor to vertex A. You should see the words "**THRU THIS POINT**" on the screen. Press an **ENTER** key. Move the screen cursor to side BC of ▵ABC. You should see the words "**PERPENDICULAR TO THIS SIDE OF THE TRIANGLE**" on the screen. Press an **ENTER** key. The TI-92 draws the perpendicular line for you.

9. If the perpendicular line does not intersect side BC of ▵ABC, then you need to extend side BC. To extend side BC of ▵ABC press **F4**. Press the number 1 to choose the **Perpendicular Line** drawing tool. Position the screen cursor on vertex B of ▵ABC. You should see the words "**THRU THIS POINT**" on the screen. Press an **ENTER** key. Move the screen cursor to the perpendicular line through vertex A of ▵ABC. You should see the words "**PERPENDICULAR TO THIS LINE**" on the screen. Press an **ENTER** key. The TI-92 extends side BC to intersect the perpendicular line through vertex A of ▵ABC.

10. You now need to place a point where the perpendicular line intersects side BC of ▵ABC. To do this press **F2**. Press the number 3 to select the **Intersection Point** tool. Move the screen cursor to the intersection of the perpendicular line and side BC. You should see the words "**POINT AT THIS INTERSECTION**" on the screen. Press an **ENTER** key. A point appears at the intersection point.

11. Use the **Label** tool to label this point D. You should have a screen similar to the following one.



12. Use the **Distance and Length** measuring tool to measure the length of AD. Write this value in the recording sheet for Heights and Areas of Triangles (supplied by your teacher).

13. Calculate the area of ▵ABC by using side BC as the base and AD as the triangle height. Write this value in the recording sheet for Heights and Areas of Triangles.

14. Open the geometry session **trhe1** that is in your folder. Use the **Distance and Length** measuring tool to measure the length of side AC of ▵ABC. Write this value in the recording sheet for Heights and Areas of Triangles. If you do not remember how to measure the lengths of the sides of a triangle refer to the section, Using the Measuring Tool to Measure the Sides of Triangle ABC, on page 23.

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15. Repeat steps 8 to 12 to draw a perpendicular line from vertex B to side AC. If the perpendicular line does not intersect side AC of △ABC, then complete step 9 to extend side AC of △ABC. Label the intersection point E. Use the **Distance and Length** measuring tool to measure the length of BE. Write this value in the recording sheet for Heights and Areas of Triangles.
16. Calculate the area of △ABC by using side AC as the base and BE as the triangle height. Write this value in the recording sheet for Heights and Areas of Triangles.
17. Open the geometry session **trhe2** that is in your folder. Use the **Distance and Length** measuring tool to measure the length of side AB of △ABC. Write this value in the recording sheet for Heights and Areas of Triangles. If you do not remember how to measure the lengths of the sides of a triangle refer to the section, Using the Measuring Tool to Measure the Sides of Triangle ABC, on page 23.
18. Repeat steps 8 to 12 to draw a perpendicular line from vertex C to side AB. If the perpendicular line does not intersect side AB of △ABC, then complete step 9 to extend side AB of △ABC. Label the intersection point F. Use the **Distance and Length** measuring tool to measure the length of AF. Write this value in the recording sheet for Heights and Areas of Triangles.
19. Calculate the area of △ABC by using side AB as the base and CF as the triangle height. Write this value in the recording sheet for Heights and Areas of Triangles.
20. What conclusion can you make about the effect of different bases and heights on the area of a triangle?

Problems

Delete the geometry sessions **pytth**, **ptpr1**, **ptpr2**, **ptpr3**, and **ptsq** that are in your folder. Copy the geometry sessions, **artr1**, **artr2**, and **artr3**, that are in the **MAIN** folder to your folder. Use the formula for the area of a triangle to solve each of the following problems. Express all answers to the nearest hundredth of a centimeter.

1. Open the geometry session "**artr1**"that is in your folder. Calculate the area of triangle DEF. Use the **Area** measuring tool to check your answer.
2. Open the geometry session "**artr2**"that is in your folder. Calculate the length of height SR. Use the **Distance and Length** measuring tool to check your answer.
3. Open the geometry session "**artr3**"that is in your folder. Calculate the area of quadrilateral STUV. Use the **Area** measuring tool to check your answer.

Lesson 13
Section 13-6 - Areas of Polygons

Problems

Delete the geometry sessions, **artr1**, **artr2**, **artr3**, **trhe**, **trhe1**, and **trhe2** that are in your folder. Copy the geometry sessions, **arpg1**, **arpg2**, and **arpg3**, that are in the **MAIN** folder to your folder. Use the formula for the area of a triangle to solve each of the following problems. Express all answers to the nearest tenth. If necessary, extend sides to intersect the perpendicular lines drawn for heights.

1. Open the geometry session "**arpg1**"that is in your folder. Draw the diagonal AC of quadrilateral ABCD. Draw the height from vertex D of $\triangle ADC$ to side AC. Use the measuring tools of the TI-92 calculator to measure the length of the base and the length of the height of $\triangle ADC$. Calculate the area of $\triangle ADC$. Draw height from vertex B of $\triangle ABC$ to side AC. Use the measuring tools of the TI-92 calculator to measure the length of the base and the length of the height of $\triangle ABC$. Calculate the area of $\triangle ABC$. Calculate the area of quadrilateral ABCD. Use the **Area** measuring tool to check your answer.
2. Open the geometry session "**arpg2**"that is in your folder. This figure is a regular hexagon. Draw three diagonals to divide the regular hexagon KLMNPQ into four triangles. Draw a height for each of the four triangles. Use the measuring tools of the TI-92 calculator to measure the length of the base and the length of the height of each of the four triangles. Calculate the area of each of the four triangles. Calculate the area of the regular hexagon KLMNPQ. Use the **Area** measuring tool to check your answer. Is there a shorter way to calculate the area of a regular hexagon?
3. Open the geometry session "**arpg3**"that is in your folder. Draw a height for the trapezoid EFGH. Use the measuring tools of the TI-92 calculator to measure the lengths of the bases and the length of the height of trapezoid EFGH. Calculate the area of trapezoid EFGH. Use the **Area** measuring tool to check your answer.

Lesson 14
Section 13-6 - The Number Π

The following investigation supplements the discussions on pages 594, 595, and 596 of your textbook. Complete this activity after reading those pages. For this activity you will work in pairs. Your teacher will give you instructions on how to choose your partner. One person in the group will work with the calculator and the other will write the data in the recording table. Therefore, before beginning this activity you need to shut off one of the calculators. Do not forget to go to the home screen before turning off the calculator. Follow the instructions carefully. If you do not understand the instructions, discuss the problem between the two of you first. Only after the two of you decide that you do not understand the instructions can you ask your teacher for help.

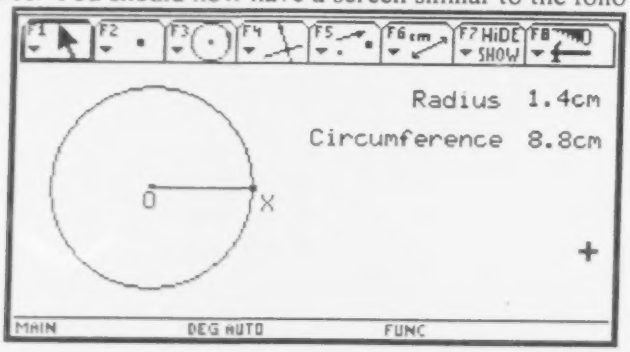
The Number Π

1. Open a new geometry session in your folder. Name the new geometry session "**pye**". If you do not remember how to open a new geometry session in your folder refer to the section, Starting a New Geometry Session Using Your New Folder, on page 18.
2. Set the precision of the calculator measurement to tenths. If you do not remember how to set the precision to tenths refer to the section, Setting the Precision of your TI-92 Calculator Measurements, on page 20.
3. Use the **Circle** tool to draw a circle. Position the circle on the left hand side of the screen. If you do not remember how to draw a circle refer to the section, Drawing a Circle, on page 10.
4. You now need to draw a radius in the circle. Remember that a radius of a circle is a line segment joining the center of the circle to a point on the circle. To draw the radius press **F2** and then press the number 5 to choose **Segment** tool. Use the cursor pad to move to the center point of the circle. The words "**THIS POINT**" should appear on the screen. Press an **ENTER** key. Then move the cursor outward toward the circle. When the words "**ON THIS CIRCLE**" appear, press an **ENTER** key to complete the radius.
5. Use the **Label** tool to label the center point of the circle O and the point where the radius meets the circle X. If you do not remember how to label points refer to the section, Labeling Vertices of a Triangle, on page 22.
6. Use the **Distance & Length** measuring tool to measure the length of radius OX. Write this value in the recording sheet for The Number Π (supplied by your teacher). If you do not remember how to measure lengths of line segments refer to the section, Using the Measuring Tool to Measure the Sides of Triangle ABC, on page 23.
7. Use the **Pointer** tool and the **HAND LOCK** key to drag the value measurement for radius OX to the top right hand corner of the screen. If you do not remember how to drag objects refer to the section, Dragging Geometric Figures and text, on page 13.
8. Use the **Comment** tool to place the words "Radius" in front of this number. If necessary use the **Pointer** tool and the **HAND LOCK** key to reposition the word "Radius". If you do not remember how to use the **Comment Box** to make comments refer to the section, Comment Box, on page 12.
9. To get the circumference of the circle press **F6** and then press the number 1 to choose the **Distance & Length** tool. Use the cursor pad to move the cursor to the circle. The words

"**CIRCUMFERENCE OF THIS CIRCLE**" should appear on the screen. Press an **ENTER** key to display the circumference. Write this value in the recording sheet for The Number Π.

9 Use the **Pointer** tool and the **HAND LOCK** key to drag the value measurement for the circumference of the circle to the top right hand corner of the screen and place it below the value for the radius.

10 Use the **Comment** tool to place the word "Circumference" in front of the number for the circumference. If necessary drag the bottom right hand corner of **Comment Box** to widen the **Comment Box** so that the word "Circumference" is on one line. Use the **Pointer** tool and the **HAND LOCK** key to reposition the word "Circumference" in front of the number for circumference. You should now have a screen similar to the following one:



11 Use the **Pointer** tool and the **HAND LOCK** key to drag the circle to make the circle larger or smaller. Make sure to drag the circle and not the center point of the circle.

12 Record five additional values for the radius OX and the circumference of the circle in the recording sheet for The Number Π.

13 Calculate the diameter for each of the six circles and record these values in the recording sheet for The Number Π. To calculate the diameter multiply the radius by 2.

14 Calculate the ratio "Circumference/Diameter" for each of the six circles. Write these values in the recording sheet for The Number Π.

15 What appears to be true for the ratio "Circumference/Diameter" for a circle? What name does mathematics give to this value?

Problems

Delete the geometry sessions, **arpg1**, **arpg2**, and **arpg3**, that are in your folder. Copy the geometry sessions, **py1**, **py2**, and **py3**, that are in the **MAIN** folder to your folder. Use the relationship between the circumference of a circle and its diameter to solve each of the following problems. Use the 3.14 for the value of Π. Express all answers to the nearest tenth of a centimeter.

1 Open the geometry session "**py1**"that is in your folder. Calculate the length of diameter A B. Use the **Distance and Length** measuring tool to check your answer.

2 Open the geometry session "**py2**"that is in your folder. Calculate the circumference of the circle. Use the **Distance and Length** measuring tool to check your answer.

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3 Open the geometry session "**py3**"that is in your folder. Calculate the length of line segment AC. Use the **Distance and Length** measuring tool to check your answer.

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Lesson 15
Section 13-7 - Circles and Sectors

Problems

Delete the geometry sessions, **arpg1**, **arpg2**, **arpg3**, **pye**, **py1**, **py2**, and **py3** that are in your folder. Copy the geometry sessions, **cs1**, **cs2**, and **cs3**, that are in the **MAIN** folder to your folder. Use the formula for the area of a circle to solve each of the following problems. Use the 3.14 for the value of Π. Express all answers to the nearest tenth of a cm^2.

1. Open the geometry session "**cs1**" that is in your folder. Calculate the area of the circle. Use the **Area** measuring tool to check your answer.
2. Open the geometry session "**cs2**" that is in your folder. Calculate the area of the circle. Use the **Area** measuring tool to check your answer.
3. Open the geometry session "**cs3**" that is in your folder. Calculate the area of the circle. Use the **Area** measuring tool to check your answer.

Reference
TI-92 Calculator Operation

Overview of TI-92 Calculator

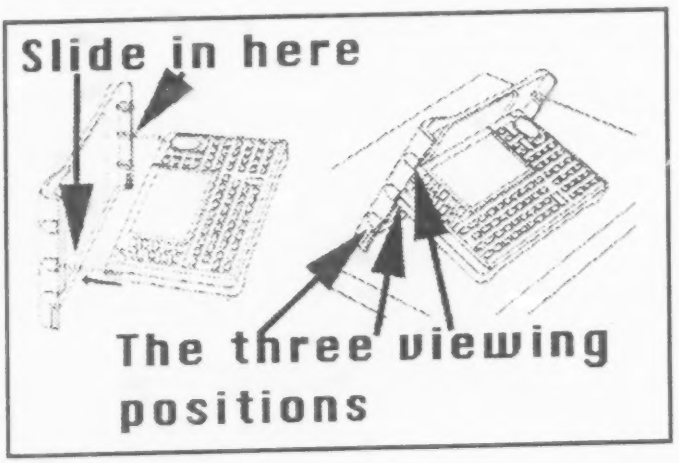
This section will explain to you some essential features that you need to understand about the operation of the TI-92 calculator. All of these features will be covered in class. You should refer to this section when you are unsure how to complete a particular function on the calculator. If the problem you are experiencing is not explained in this section, then talk to your teacher about the specific difficulties that you are having.

The entries in this section have several features to help you reference easily and quickly.

- Each topic is highlighted for quick reference.
- Explanations are given in an ordered step format.
- Diagrams are included where necessary.

Using the Snap-On Cover as a Stand

To make it easier to see the screen on the TI-92 calculator you can use the snap-on cover to angle the screen. To do this slide the tabs on the top sides of the calculator into the slots in the cover.



There are three different slots on the cover. These give you three different viewing angles. Experiment with the different viewing angles and find the angle that gives you the best view of the screen.

BATT Display

If the bottom line on your calculator ever displays the word **BATT**, tell your teacher immediately because the batteries in your calculator need to be replaced.

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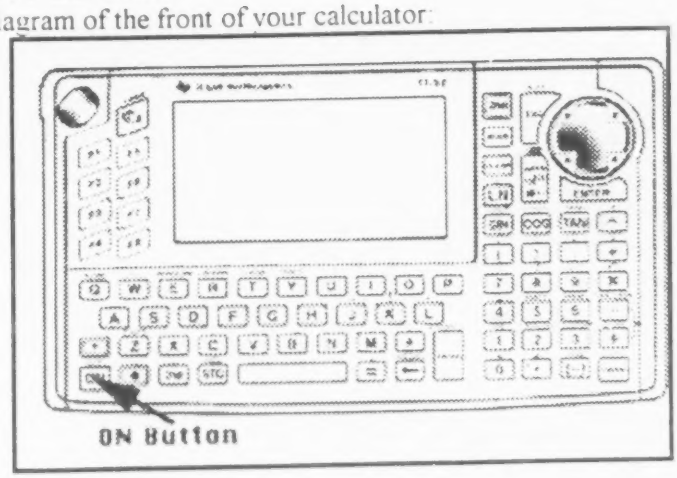
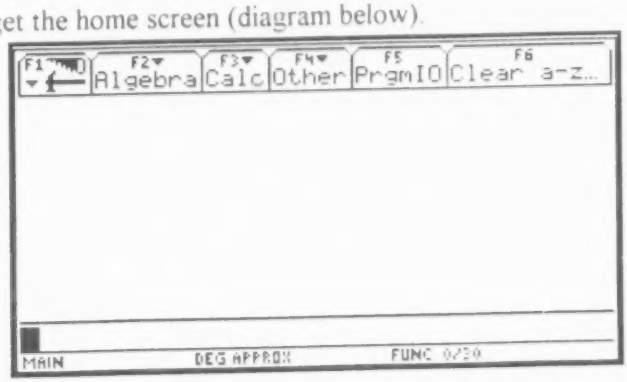
Turning On the TI-92 Calculator

Below is a diagram of the front of your calculator:



1. The **ON** button is in the bottom left hand corner of your calculator. Press this button and you should get the home screen (diagram below).



2. If you can not see the home screen refer to topic **Adjusting Screen Display**.
3. If you see a different screen (not the home screen) refer to topic **Getting the Home Screen**.

Getting the Home Screen

Before turning off the calculator, you should be back at the home screen. To get to the home screen from any application complete the following steps:

1. Press the **green diamond [◆]** key (second key to the right from bottom left hand corner).
2. Press the **Q** key.

Turning Off the TI-92 Calculator

From your application, return to the home screen (see **Getting the Home Screen**). To turn off the TI-92 calculator, press the **2nd** key (third button to the right from left bottom corner) and then the **ON** key (bottom left hand corner).

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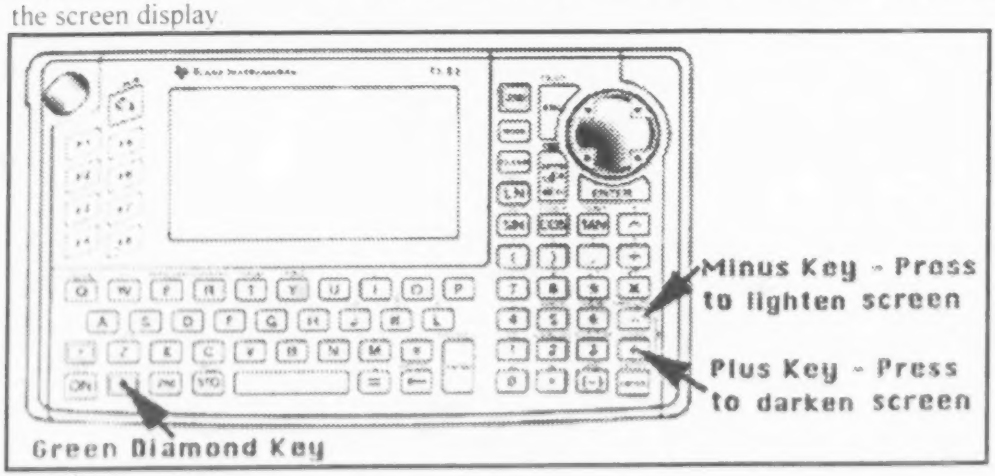
Adjusting Screen Display

Sometimes when you turn on the calculator, it is difficult to see the screen (you may not be able to see anything). Other times when you are completing some geometry problems you may have difficulty seeing the figures on the screen. At any time or in any application you can darken or lighten the screen display to make it easier to see the screen. To adjust the screen display, complete the following steps:

1. Press and hold down the **green diamond [◆]** key (second key to the right from bottom left hand corner).
2. Press the **plus [+]** key (second key up from bottom right hand corner) to darken the screen display or press the **minus [−]** key (third key up from bottom left hand corner) to lighten the screen display.



If you press the **green diamond [◆]** key but do not hold it down, then pressing the **plus [+]** key or the **minus [−]** key will not lighten or darken the screen. It is important to *press and hold down* **the green diamond [◆]** key when trying to adjust the screen display.

If you have to lighten or darken the screen often, check the bottom line on the calculator to see if **BATT** is displayed. If so, tell your teacher because the batteries in the calculator need to be replaced.

Typing Uppercase (Capital) Letters

You can get uppercase (capital) letters in one of two ways:

1. By using the upper arrow **[↑]** key - Using this key makes the next letter entry uppercase. Letters typed afterwards are lowercase.
2. By using the **2nd** and **Z** keys - Using this key combination makes all letters typed afterwards uppercase letters. To change back to lowercase letters you will need to press the **2nd** and **Z** keys again. The calculator automatically returns to lowercase when a new geometry session is opened.

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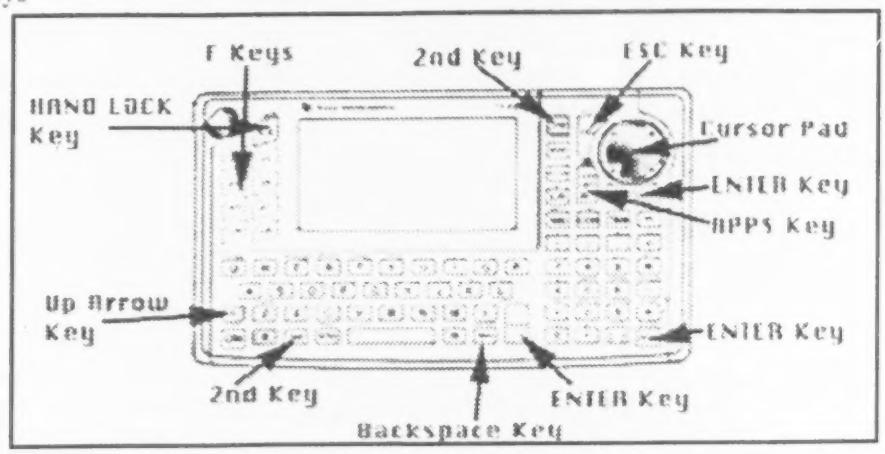
Special Keys



Cursor Pad

The cursor pad is the large blue button in the top right hand corner of your calculator. By pressing the cursor pad, you can move around the screen. For example, pressing on the left hand side of the cursor pad moves the screen cursor to the left.

ESC Key

The **ESC** key is used to cancel any menu or dialog box.

ENTER Keys

There are three **ENTER** keys on the TI-92 calculator. All of these **ENTER** keys perform the same functions. Pressing an **ENTER** key executes the last instruction that you gave the calculator. In the geometry application, this usually means that you need to press the **ENTER** key more than once to execute the instruction. For example, if in the geometry application you press **F3** and then choose **1: Circle**, then you will need to press an **ENTER** key twice since to draw a circle you need to define two things, the center of the circle and the radius of the circle. Thus, pressing an **ENTER** key the first time defines the center of the circle and pressing an **ENTER** key the second time defines the size of the circle. If you forget to press the **ENTER** key the second time, then your circle will disappear from the screen.

2^{nd} Keys

There are two 2^{nd} keys on your calculator. One of these keys is located next to the **ESC** key. The other is located next to the **green diamond [◆]** key. Pressing one of the 2^{nd} keys lets you access the second function of the next key you press. The 2^{nd} function of the keys is the yellow symbol above the key. For example pressing the 2^{nd} key and then the multiplication key [×] actually gets you the square root [√] symbol.

Up Arrow [↑] Key

The up arrow [↑] key is used to type an uppercase (capital) letter (same as the shift key on a computer). To type a capital letter complete the following steps:

1. Press the Up Arrow [↑] key.
2. Press the letter of your choice.
3. The letter you pressed should be uppercase (capital).

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APPS Key

Pressing the **APPS** key gives you a choice of applications. We are interested in the geometry application which is number 8.

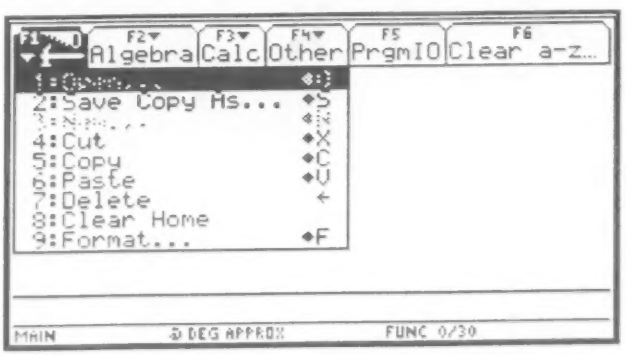
Backspace Key [←]

To delete entries, you can use the backspace key **[←]**. Complete the following steps to do this.

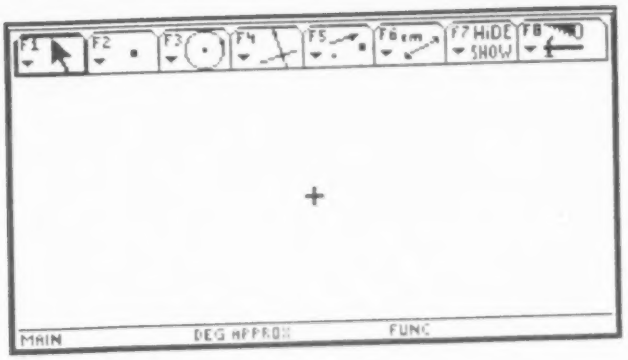
1. Use the cursor pad to position the screen cursor one character to the right of the entry to be deleted.
2. Press the backspace key **[←]**.
3. This will delete the entry immediately to the left of the cursor.
4. Repeat these steps to delete all unwanted entries.
5. In a geometry session you can use the pointer (**F1 #1**) to choose an entry (move cursor to entry and when the name of entry appears on the screen press enter). Then press the backspace key **[←]** to delete that entry. This includes diagrams, labels, measures, or comments that you have drawn.
6. If an entry is highlighted, then pressing the backspace key [←] deletes the highlighted entry.

F Keys

The **F** (Function) keys are on the left hand side of your screen. These **F** keys give you access to the functions listed when you press them. For example, on the home screen if you press **F1**, you get the following choices:



1. You can use the cursor pad to move down and up through the different choices.
2. When your choice is highlighted, press an **ENTER** key.
3. Steps 1 and 2 can be collected quickly by pressing the number of the choice. The calculator then executes the function listed for that number.
4. If after pressing an **F** key, you decide you do not wish to do any of the functions listed, then press the **ESC** key.
5. In the geometry application your choice of function is displayed next to its **F** key. For example, if you choose **1: Circle** under **F3** then a diagram of a circle will appear to the left of **F3**.



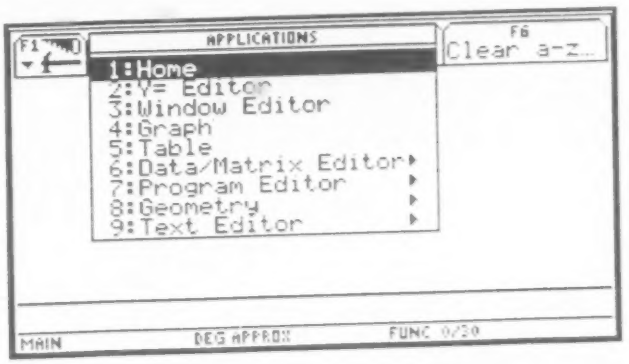
Hand Lock Key

The hand lock key is used with the cursor pad to manipulate geometry objects. You need to *press and hold down* this key while manipulating geometry objects.

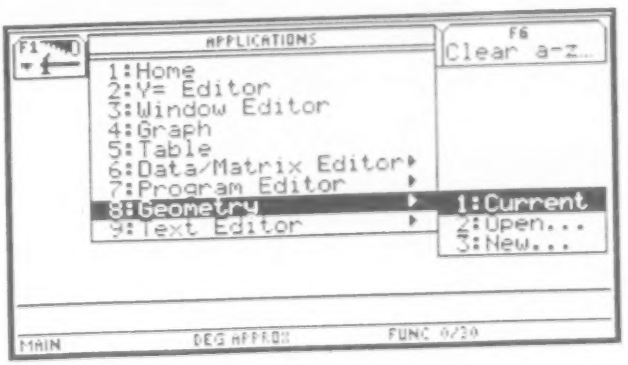
Starting a New Geometry Session

To start a new geometry session, complete the following steps:

1. Press the **APPS** key (just to the left of the cursor pad). You should get the following screen:



2. Choose **8: Geometry** by either using the cursor pad to scroll down and then pressing an **ENTER** key or by pressing the number 8 on the calculator. You should get the following screen:



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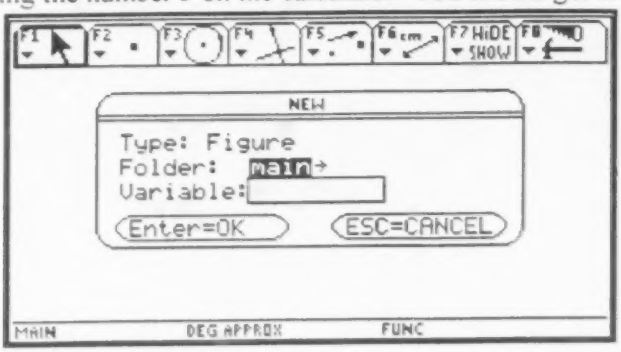
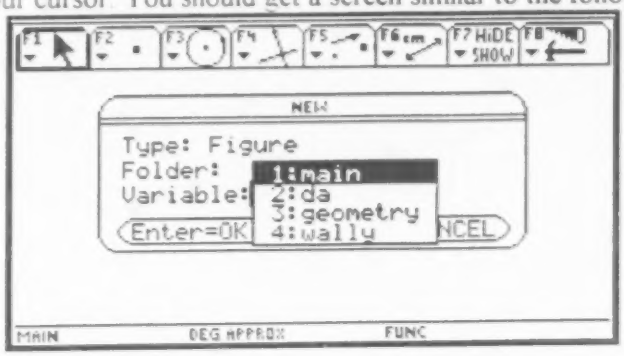
If you chose the wrong application (application other than geometry), press the **APPS** key again to start over.

3 Choose **3: New** by either using the cursor pad to scroll down and then pressing an **ENTER** key or by pressing the number 3 on the calculator. You should get the following screen:



If you pressed the wrong number, then press the **APPS** key again to start over.

4 The word **main** to the right of the word "**Folder:**" should be blinking. Press on the right hand side of your cursor. You should get a screen similar to the following one:



5 Choose your folder by either using the cursor pad to scroll down and then pressing an **ENTER** key or by pressing the number of your folder.

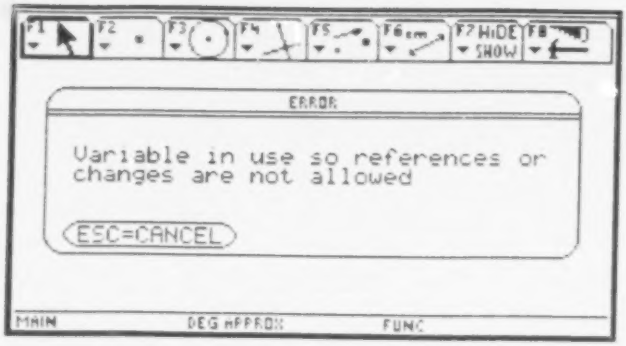
6 Your folder's name should now be blinking to the right of the word "**Folder:**". If not, you chose the wrong folder. In this case, repeat step 5 and choose your folder.

7 Press down on the cursor pad. The screen cursor should now be blinking to the right of the word "**Variable:**"

8 Type in a name for your geometry session.

9 Press an **ENTER** key.

10 Press an **ENTER** key. If you get an error screen like the following one then press the **ESC** key. Repeat steps 5 to 10 and enter a different name for your geometry session.

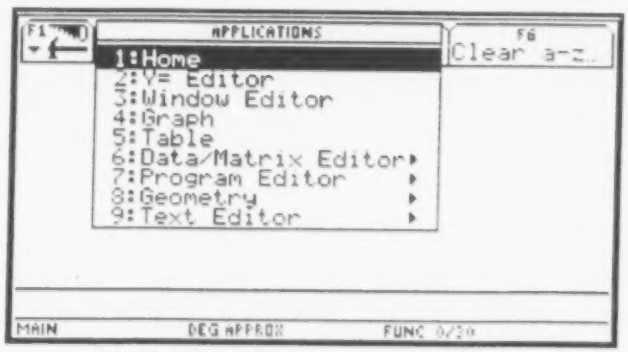


11 You should now get a new blank geometry screen

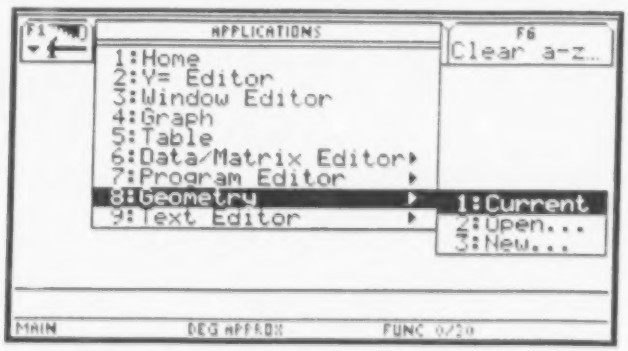
Opening a Previous Geometry Session

To open a geometry session that you worked with previously, complete the following steps:

1 Press the **APPS** key (just to the left of the cursor pad). You should get the following screen:

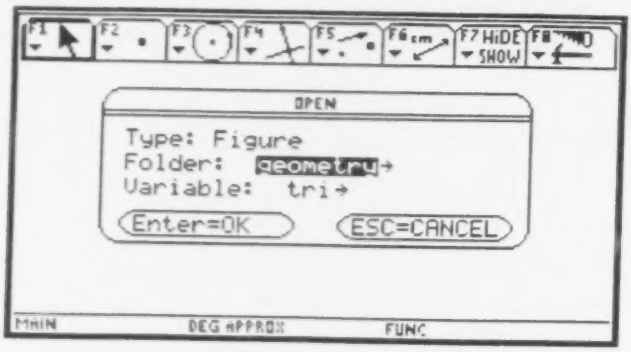


2 Choose **8: Geometry** by either using the cursor pad to scroll down and then pressing an **ENTER** key or by pressing the number 8 on the calculator. You should get the following screen:



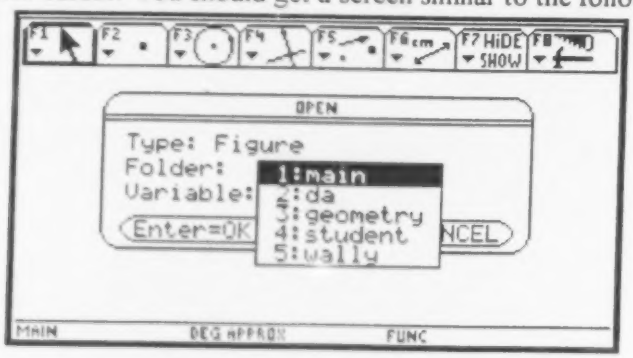
If you chose the wrong application (application other than geometry), press the **APPS** key again to start over.

3 Choose **2: Open** by either using the cursor pad to scroll down and then pressing an **ENTER** key or by pressing the number 2 on the calculator. You should get a screen similar to the following one.



If you pressed the wrong number, then press the **APPS** key again to start over.

4 The word **main** to the right of the word "**Folder:**" should be blinking. Press on the right hand side of your cursor. You should get a screen similar to the following one.

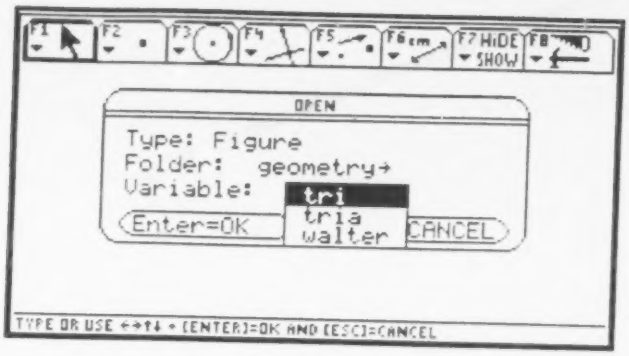


5 Choose your folder by either using the cursor pad to scroll down and then pressing an **ENTER** key or by pressing the number of your folder.

6 Your folder's name should now be blinking to the right of the word "**Folder:**". If not, you chose the wrong folder. In this case, repeat step 5 and choose your folder.

7 Press down on the cursor pad. The screen cursor should now be blinking to the right of the word "**Variable:**"

8 A variable name to the right of the word "**Variable:**" should be blinking. Press on the right- hand side of your cursor. You should get a screen similar to the following one:



9 Choose the previous geometry session that you wish to open by using the cursor pad to scroll down to highlight this session and then pressing an **ENTER** key.

10 Your previous session's name should now be blinking to the right of the word "**Variable:**" If you chose the wrong session, then repeat steps 8 and 9.

11 Press an **ENTER** key.

12 You should get a geometry screen displaying diagrams from your previous session. You can now make any changes that you wish to make to these diagrams. When the calculator is turned off, the changes that you made will be saved.

File Management

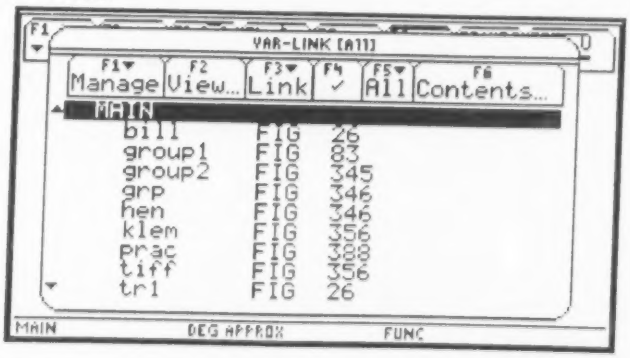
Every time you shut off your TI-92 calculator it saves your last geometry session. After using the calculator several different times you can have many unwanted saved sessions. You probably want to delete some of these sessions since you do not want to work with them anymore. Other sessions you may want to place together in a new folder because they are explorations on similar topics in geometry. The TI-92 calculator saves folder in uppercase (capital) letters and sessions in lowercase letters. This section will explain to you how to delete unwanted sessions, how to make new folders, and how to move/copy sessions between folders.

Deletion of Sessions (Files)

1 Press the **2nd** key (third button to the right from left bottom corner).

2 Press the **minus [−]** key (third key up from bottom left hand corner).

3 You should now see a screen like the one below. If not, repeat steps 1 and 2. This is called the **VAR-LINK** screen.



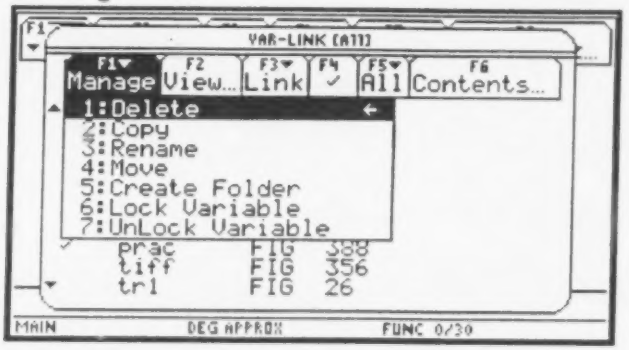
4 Use the cursor pad to highlight the session that you wish to delete. Sessions are always listed on the screen in lowercase letters. Folders are always listed in uppercase (capital) letters.

5 Press **F4** - Note the ✔ that appears in front of this session. Do not checkmark [✔] a folder. Checkmarking a folder will delete all sessions contained in the folder and the folder itself.

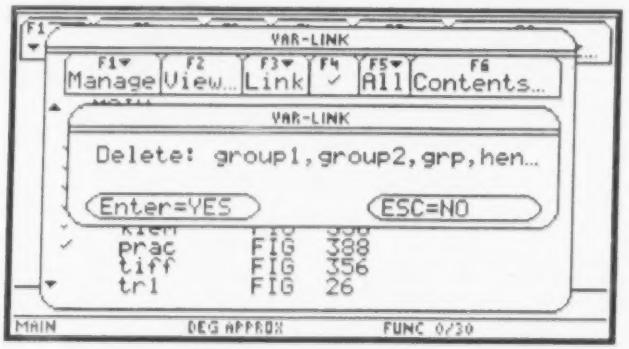
6 Repeat steps 4 and 5 to checkmark [✔] all other sessions that you wish to delete.

7 Before proceeding to delete the sessions, scroll down through all the sessions and make sure that only the sessions that you wish to delete are checkmarked [✔]. To uncheckmark a session, press **F4** when the session is highlighted. This should remove the checkmark [✔] from in front of this session.

8 When only the sessions that you wish to delete are checkmarked [✔], then press **F1**. You should see the following choices:



9 Choose **1: Delete** by either using the cursor pad to highlight it and then pressing an **ENTER** key or by pressing the number 1. You should get a screen similar to the following one:



10 All sessions to be deleted are listed after the word "**Delete:**". If these session names are correct, press an **ENTER** key. If some of these session names are not right, then press the **ESC** key and repeat steps 7 to 9.

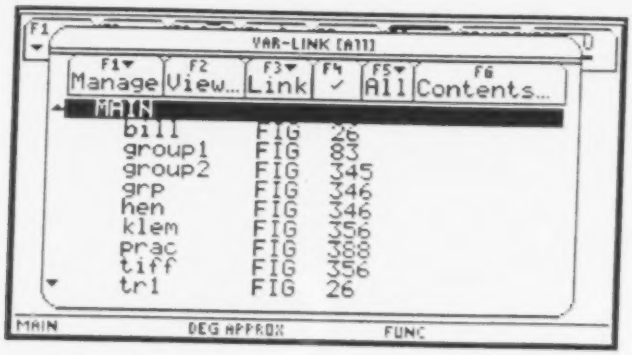
11 All checkmarked [✔] sessions are now deleted.

12 You can prevent accidental deletion of certain sessions or folders by locking the particular sessions or folders. To do this, first checkmark [✔] the sessions or folders that you do not

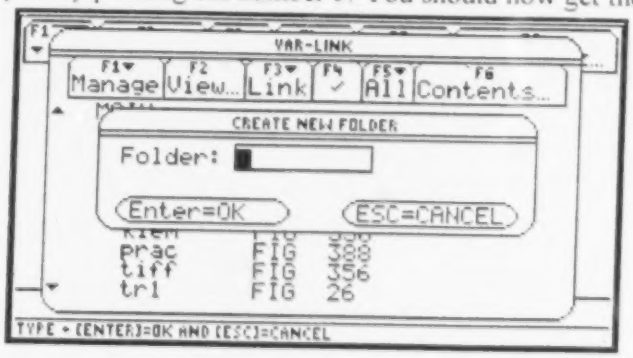
wish to delete (do this by pressing **F4**). Then press **F1** and choose **6: Lock Variables**. The locked folders and sessions now cannot be deleted.

Creating a New Folder

1. Press the **2nd** key (third button to the right from left bottom corner).
2. Press the **minus [-]** key (third key up from bottom left hand corner). You should now see a screen similar to the one below. If not, repeat steps 1 and 2. This is called the **VAR-LINK** screen.



3. Press **F1**.
4. Choose **5: Create Folder** by either using the cursor pad to scroll down and then pressing an **ENTER** key or by pressing the number 5. You should now get the following screen:



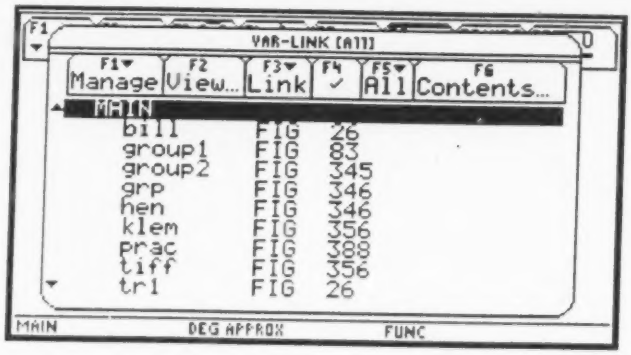
5. Type the name for your new folder in the dialog box to the right of the word "**Folder:**" If you make a mistake, use the backspace key **[←]** to delete all entries back as far as your mistake and retype all deleted entries.
6. Press an **ENTER** key.
7. Press an **ENTER** key.
8. The new folder should now appear on the screen. Folders are listed on the screen in alphabetical order and in uppercase (capital) letters. You may have to use the cursor pad to scroll down the screen to find your folder.
9. If you have spelled your folder name incorrectly, use the cursor pad to highlight the folder and then press **F1**. Choose **3: Rename** by either using the cursor pad to scroll down and then pressing an **ENTER** key or by pressing the number 3. Type in the corrected name for

your folder. Press an **ENTER** key twice. The corrected name for the folder should now appear on the screen. You can also use the **Rename** function to change the name of a session.

Moving/Copying Sessions between Folders

To transfer previous geometry sessions between two folders you can either use the **move** function or the **copy** function. The move function moves the sessions from the old folder to the new folder. Therefore, with the move function the sessions are deleted from the old folder. The copy function makes a copy of the sessions in the new folder. Thus, with the copy function the sessions are now in both the old and new folders. To complete either of these procedures follow these steps:

1. Press the **2nd** key (third button to the right from left bottom corner).
2. Press the **minus [-]** key (third key up from bottom left hand corner). You should now see a screen similar to the following one. If not repeat steps 1 and 2. This is called the **VAR-LINK** screen.



3. Use the cursor pad to highlight the session that you wish to move or copy. Sessions are always listed on the screen in lowercase letters. Folders are always listed in uppercase (capital) letters.
4. Press **F4** - Note the ✔ that appears in front of this session.
5. Repeat steps 3 and 4 to checkmark [✔] all other sessions that you wish to move or copy.
6. Before proceeding to moving or copying the sessions, scroll down through all the sessions and make sure that only the sessions that you wish to move or copy are checkmarked [✔]. To uncheckmark a session press **F4**. This should remove the checkmark [✔] from in front of this session.
7. When only the sessions that you wish to move or copy are checkmarked [✔], then press **F1**. You should see the following choices:

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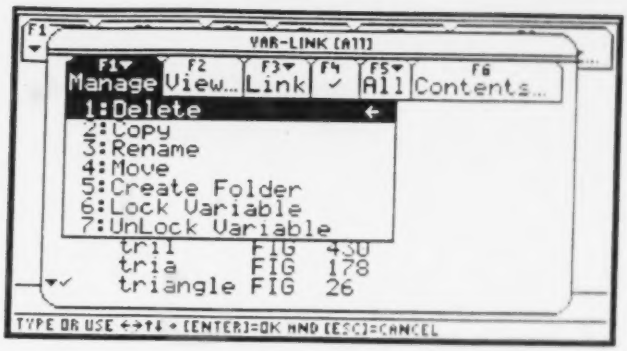
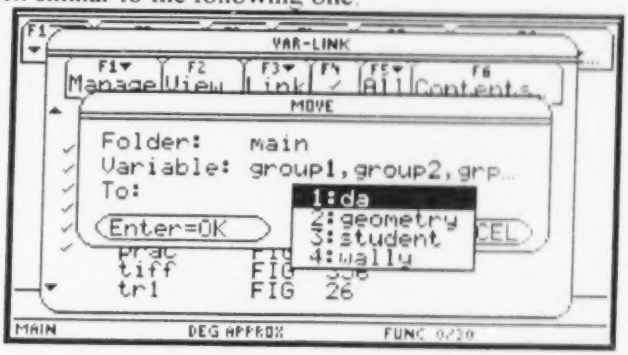


If you want to move the sessions complete steps 8 to 12. If you want to copy the sessions complete steps 13 to 17.

8 To move the checkmarked [✔] sessions choose **4: Move** either using the cursor pad to scroll down and then pressing an **ENTER** key or by pressing the number 4. You should now get a screen similar to the following one:



9 All sessions to be moved are listed after the word "**Variable:**". If these session names are correct, then you can proceed to step 10. If some of these session names are not right, then press the **ESC** key and repeat steps 4 to 9.

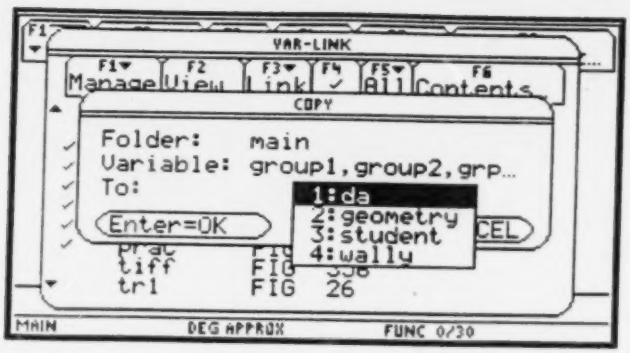
10 When the geometry sessions listed after **Variable:** are correct, then you need to identify the moved **to: folder**. Press on the right hand side of the cursor. From the list of folders, highlight the folder into which the sessions are to move.

11. Press an **ENTER** key.

12 As a last precaution, check the Move dialog box to make sure all information is now correct. If all information is correct, then press an **ENTER** key. If the list of sessions is not right, press the **ESC** key. If the moved **to: folder** is not right, then repeat steps 10 to 12.

13 To copy the checkmarked [✔] sessions, choose **2: Copy** by either using the cursor pad to scroll down and then pressing an **ENTER** key or by pressing the number 2. You should now get a screen similar to the following one:

BEST COPY A



14 All sessions to be copied are listed after the word "**Variable:**". If these session names are correct, then you can proceed to step 16. If some of these session names are not right, then press the **ESC** key and repeat steps 4 to 9.

15 When the geometry sessions listed after variable are correct, then you need to identify the copied **to: folder**. Press on the right hand side of the cursor. From the list of folders, highlight the folder into which the sessions are to be copied.

16 Press an **ENTER** key.

17 As a last precaution, check the Copy dialog box to make sure all information is now correct. If all information is correct then press an **ENTER** key. If the list of sessions is not right, press the **ESC** key. If the copied **to: folder** is not right, then repeat steps 15 to 17.

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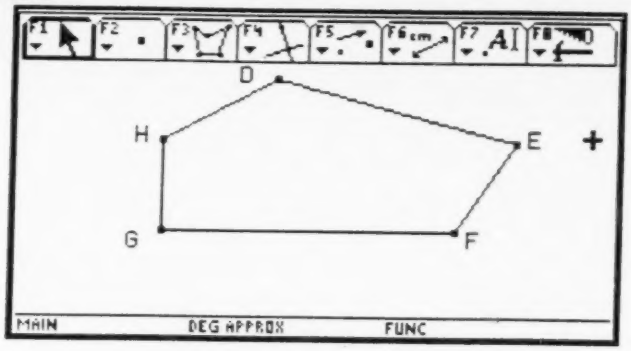
Appendix A
Screens for Lesson Problems

Lesson Problem Screens

The TI-92 calculator screens for the problems at the end of the lessons are included in this section. The problem screens are organized by lesson and problem number.

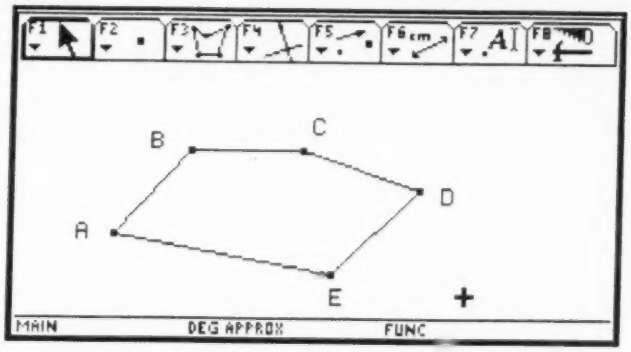
Lesson 3 - File Management, and Labeling, Marking, and Measuring Angles

Problem 1 Screen



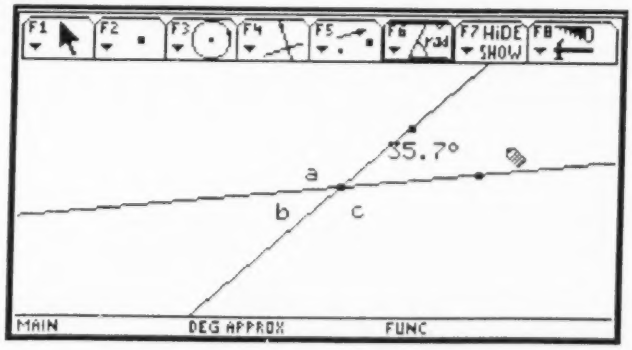
Lesson 5 - File Management and Review of TI-92 Geometry Application

Problem 3 Screen



Lesson 6 - Section 7.7 - Angles and Lines

Problem 1 Screen



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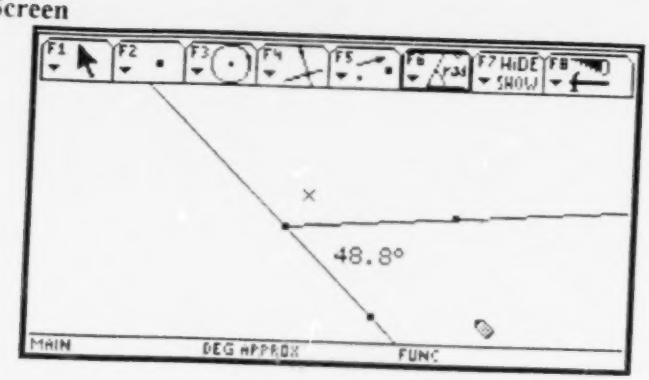
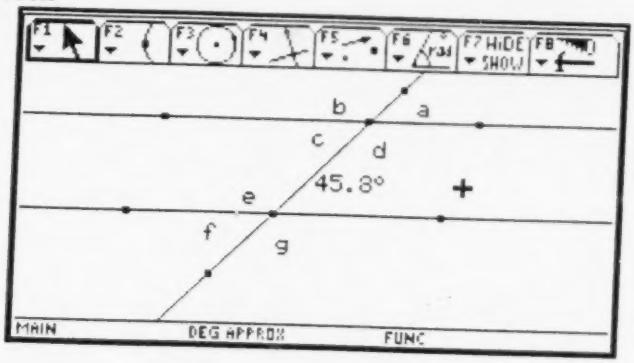
Problem 2 Screen

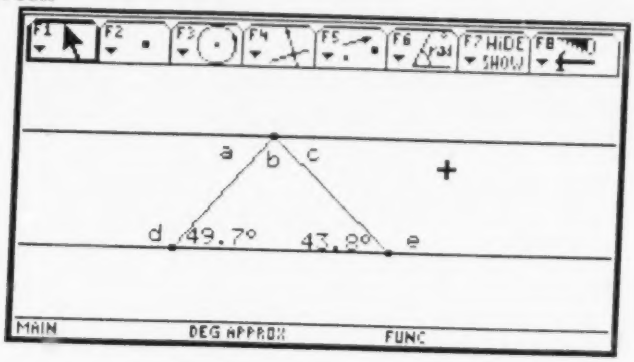


Lesson 7- Section 7-8 - Angles and Parallel Lines

Problem 1 Screen

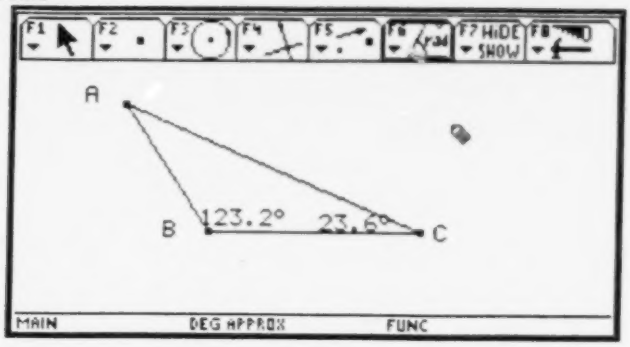


Problem 2 Screen

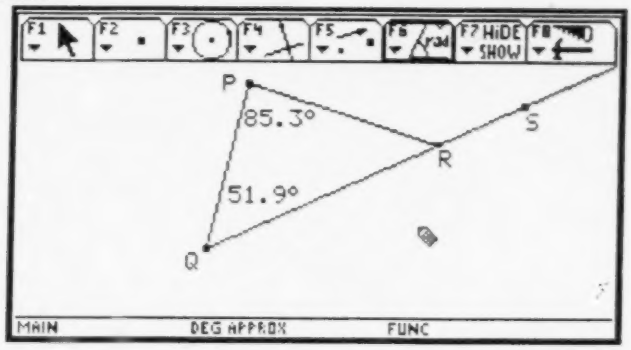


Lesson 9 - Section 7-8 - The Triangle Sum Property

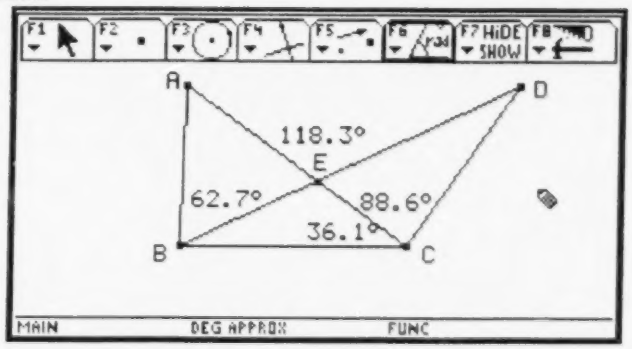
Problem 1 Screen



Problem 2 Screen



Problem 3 Screen



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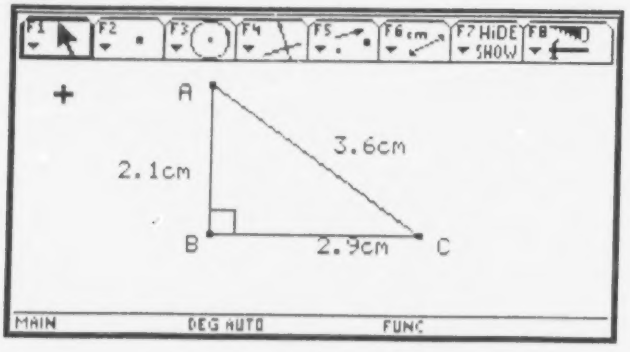
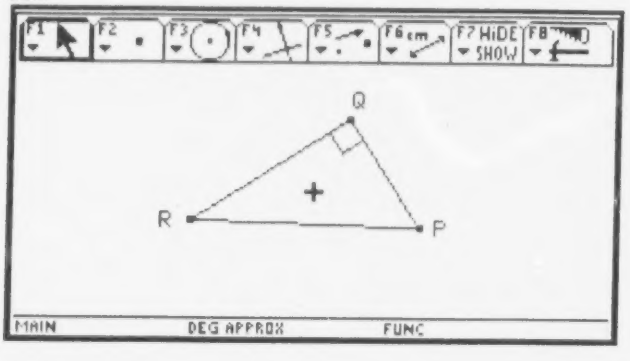
Lesson 10 - Section 13-1 - Area of a Right Triangle

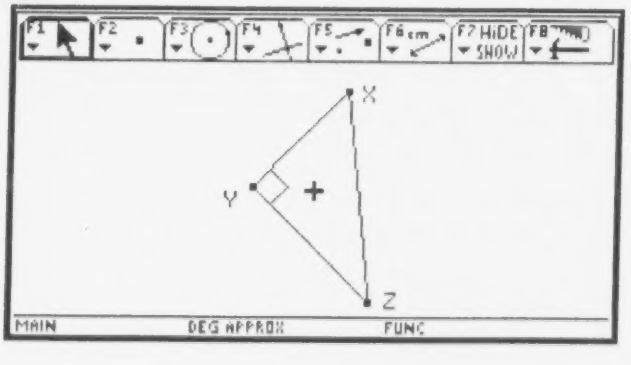
Problem 1 Screen



Problem 2 Screen



Problem 3 Screen



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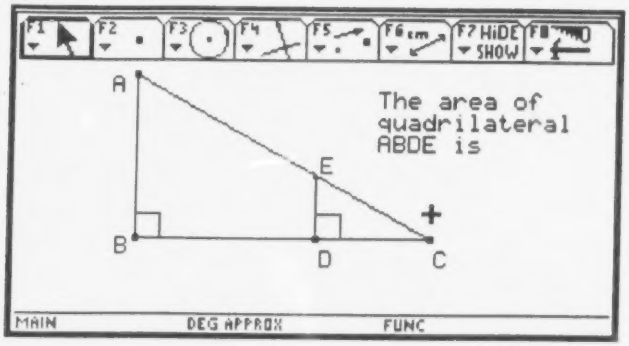
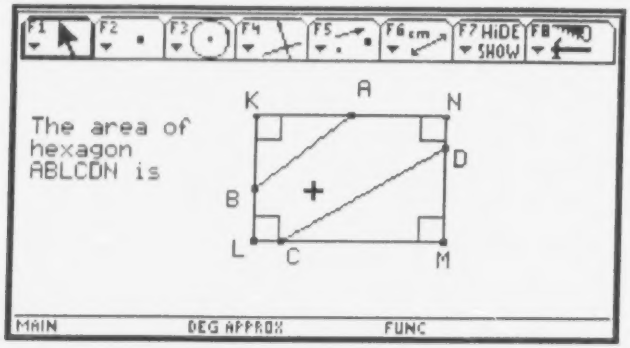
Problem 4 Screen

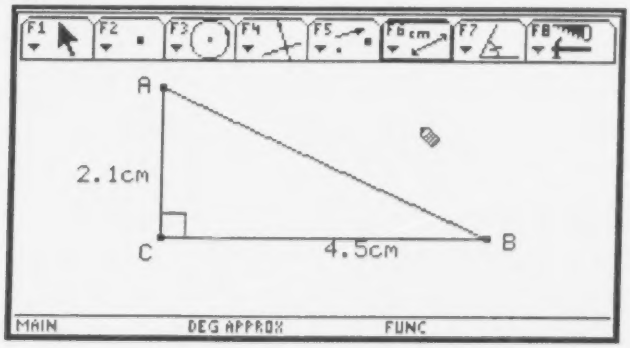


Problem 5 Screen

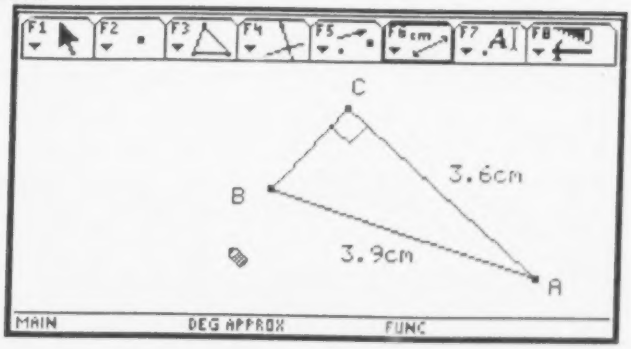


Lesson 11 - Section 13-3 - The Pythagorean Theorem

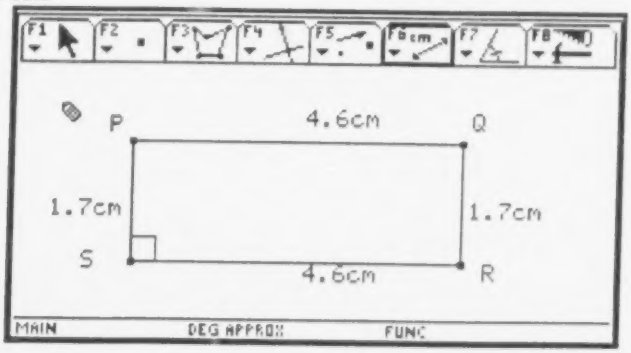
Problem 1 Screen



Problem 2 Screen

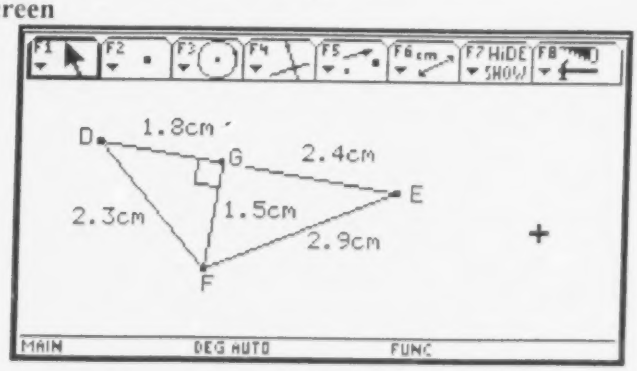


Problem 3 Screen



Lesson 12 - Section 13-4 - Area of Any Triangle

Problem 1 Screen



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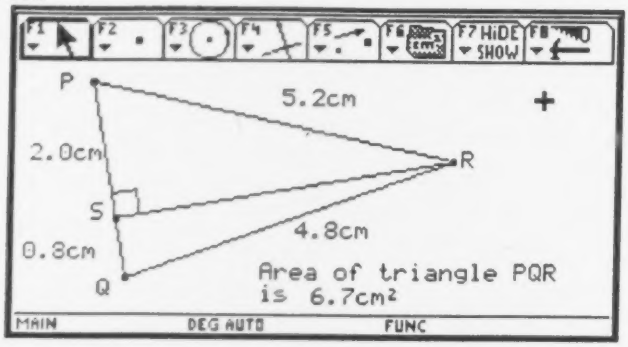
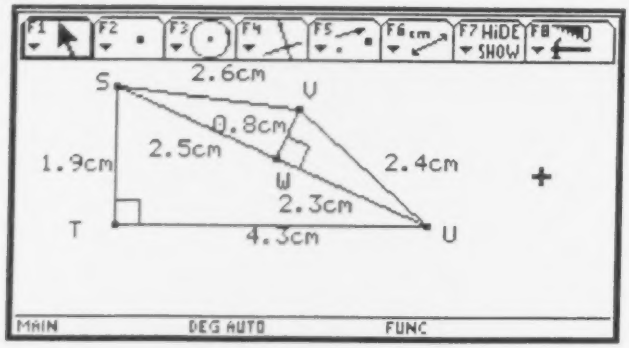
Problem 2 Screen

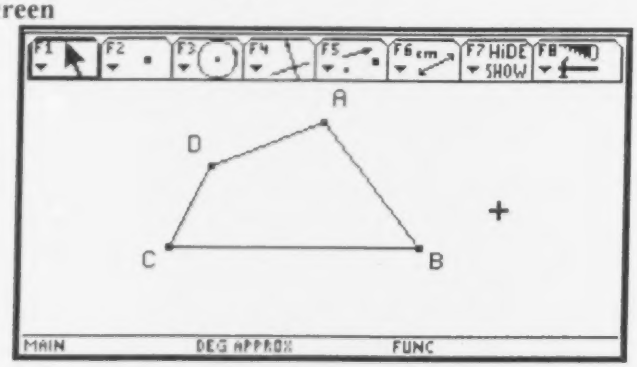


Problem 3 Screen



Lesson 13 - Section 13-6 - Areas of Polygons

Problem 1 Screen



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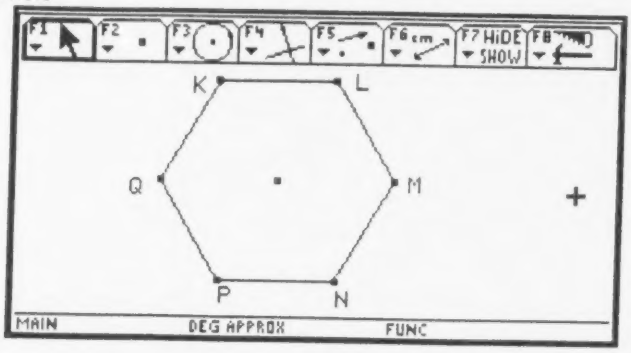
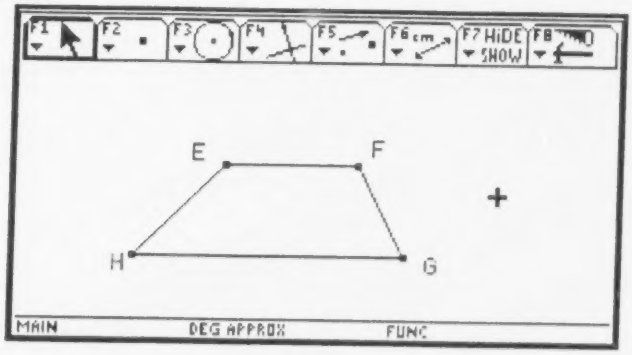
Problem 2 Screen

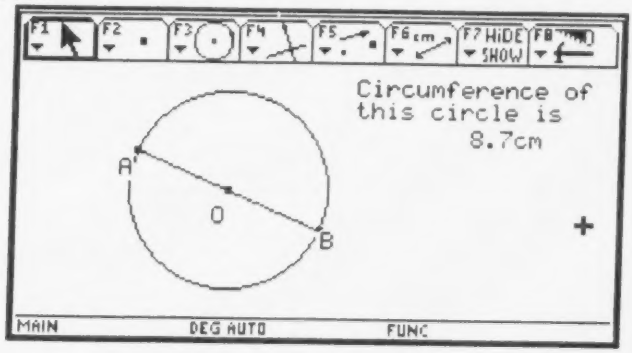


Problem 3 Screen



Lesson 14 - Section 13-6 - The Number Π

Problem 1 Screen



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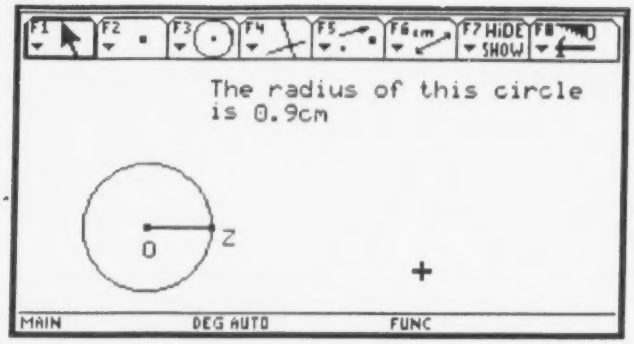
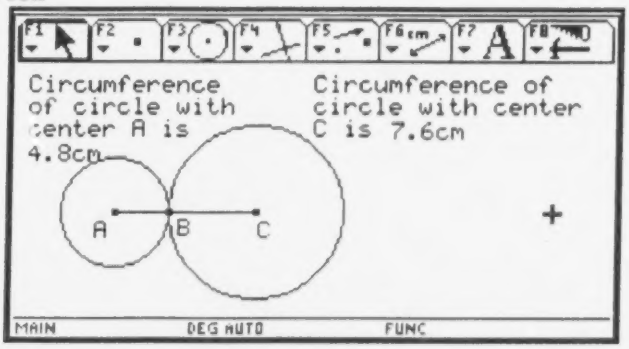
Problem 2 Screen

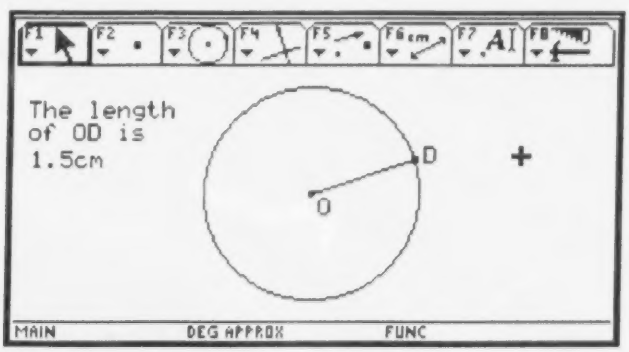


Problem 3 Screen



Lesson 15 - Section 13-7 - Circles and Sectors

Problem 1 Screen



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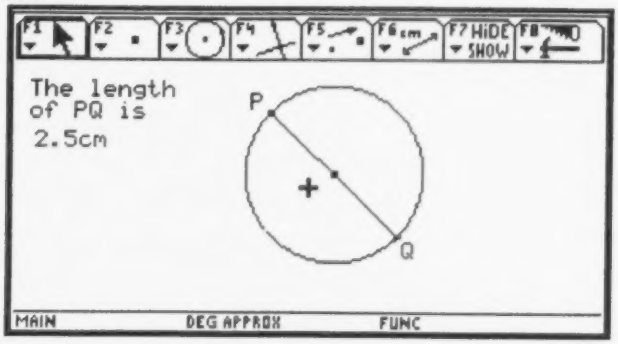
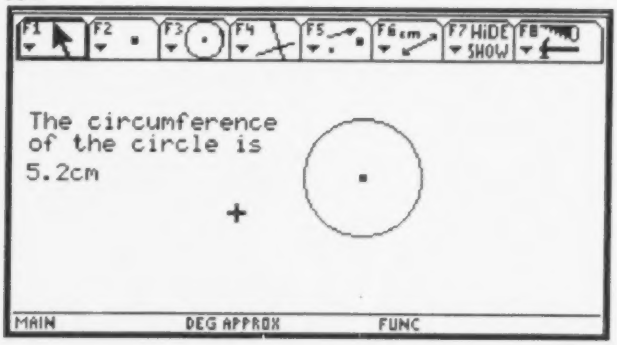
Problem 2 Screen



Problem 3 Screen



Appendix B
Recording Sheets for Student Activities

Student Recording Sheets

The TI-92 calculator student recording sheets for the activities included in the individual lessons are contained in this section. The student recording sheets are organized by lesson and page number.

Student Recording Sheet #1
Lesson 2 - Page 20 and 21

Recording Sheet - Line Segment Measurement

Length of Line Segment (Ruler Measure) _____ cm
Length of Line Segment (TI Measure) _____ cm
Difference between two measurements _____ cm

Student Recording Sheet #2
Lesson 2 - Pages 22 - 24

Recording Table - Measures of Sides of Triangle ABC

Side	Ruler Measure (cm)	TI Measure (cm)	Difference
AB			
BC			
AC			
Perimeter of $\triangle ABC$			

Student Recording Sheet #3
Lesson 3 - Pages 28-29

Recording Table - Angle Measure

Student Number	Protractor Angle Measure	TI-92 Calculator Measure	Difference
1			
2			
3			
4			
5			

Student Recording Sheet #4
Lesson 3 - Page 29

Recording Table - Resizing Angles

Measure of ∠ABC	Type of Angle

Student Recording Sheet #5
Lesson 4 - Pages 39 - 40

Recording Table - Regular Pentagon

Trial	Sides(cm)					Angles(degrees)				
	AB	BC	CD	DE	AE	ABC	BCD	CDE	DEA	EAB
1										
2										
3										
4										
5										

Student Recording Sheet #6
Lesson 4 - Page 40

Recording Table for Regular Hexagon

Trial	Sides						Angles					
	PQ	QR	RS	ST	TU	PU	PQR	QRS	RST	STU	TUP	UPQ
1												
2												
3												
4												
5												

Student Recording Sheet #7
Lesson 6 - Pages 44 - 46

Recording Sheet for Linear Pairs

Measure of ∠ABD	Measure of ∠CBD	Sum of m∠ABD and m∠CBD

Student Recording Sheet #8
Lesson 6 - Pages 46 - 48

Recording Table - Vertical Angles

Measure of ∠ABE	Measure of ∠CBD	Measure of ∠ABD	Measure of ∠EBC

Student Recording Sheet #9
Lesson 7 - Pages 50 - 51

Recording Table - Corresponding Angles ∠ABF and ∠BCH

Measure of ∠ABF	Measure of ∠BCH

Student Recording Sheet #10
Lesson 7 - Pages 51 - 52

Recording Table - Corresponding Angles ∠FBC and ∠HCD

Measure of ∠FBC	Measure of ∠HCD

Student Recording Sheet #11
Lesson 7 - Page 52

Recording Table - Corresponding Angles ∠ABE and ∠BCG

Measure of ∠ABE	Measure of ∠BCG

Student Recording Sheet #11
Lesson 7 - Pages 52 - 53

Recording Table - Corresponding Angles ∠EBC and ∠GCD

Measure of ∠EBC	Measure of ∠GCD

Student Recording Sheet #12
Lesson 7 - Pages 53 - 54

Recording Table - Alternate Interior Angles ∠PLM and ∠LMS

Measure of ∠PLM	Measure of ∠LMS

Student Recording Sheet #13
Lesson 7 - Pages 54 - 55

Recording Table - Alternate Interior Angles ∠QLM and ∠LMR

Measure of ∠QLM	Measure of ∠LMR

Student Recording Sheet #14
Lesson 8 - Pages 56 - 57

Recording Sheet - Properties of a Parallelogram

Measure of Sides				Measure of Angles			
PQ	QR	RS	PS	∠SPQ	∠PQR	∠QRS	∠PSR

Student Recording Sheet #15
Lesson 8 - Pages 57 - 58

Recording Sheet - Properties of a Rhombus

Measure of Sides				Measure of Angles			
WX	XY	YZ	WZ	∠ZXY	∠WXY	∠XYZ	∠YZW

Student Recording Sheet #16
Lesson 8 - Pages 58 - 59

Recording Sheet - Properties of a Rectangle

Measure of Sides				Measure of Angles			
AB	BC	CD	AD	∠DAB	∠ABC	∠BCD	∠CDA

Student Recording Sheet #17
Lesson 7 - Pages 59 - 60

Recording Sheet - Properties of a Square

Measure of Sides				Measure of Angles			
GH	HI	IJ	GJ	∠JGH	∠GHI	∠HIJ	∠IJG

Student Recording Sheet #18
Lesson 9 - Pages 61

Recording Sheet - Triangle Sum Property

Measure of ∠ABC	Measure of ∠ACB	Measure of ∠BAC	SUM of Measures of ∠ABC, ∠ACB, and ∠BAC

Student Recording Sheet #19
Lesson 11 - Pages 65 - 66

Recording Sheet - Pythagorean Theorem

AB	BC	AC	$(AB)^2$	$(BC)^2$	$(AC)^2$

Student Recording Sheet #20
Lesson 13 - Pages 67 - 69

Recording Sheet - Heights and Areas of Triangles

Length BC		Length AC		Length AB	
Length AD		Length BE		Length CF	
Area $\triangle ABC$		Area $\triangle ABC$		Area $\triangle ABC$	

Student Recording Sheet #21
Lesson 14 - Pages 71 - 72

Recording Sheet - The Number Π

Circumference	Radius OX	Diameter	Circumference/Diameter

Appendix C
Teacher Notes

General Comments

The TI-92 activities in the student supplementary manual are to supplement your instruction in the agreed geometry sections of your textbook. You, as the teacher, need to decide the best way to integrate these activities into your instruction. The teacher notes in this appendix will give you some helpful ideas how to successfully integrate the TI-92 activities into your geometry instruction. Since this project is still experimental all notes and suggestions for future improvements would be appreciated.

The suggested time frame for each of the 15 supplementary lessons is one hour. This is an estimated time since most of these lessons have not be used in a classroom setting. It is expected that you will require four to six weeks to complete the appropriate geometry sections in your textbook with the TI-92 supplementary activities. The plan is to administer the geometry achievement test and the geometry attitude survey during the second week of March. The test results for your students will be available to you in April.

The TI-92 supplementary geometry activities make use of the features of the TI-92 calculator. In the initial lessons, students draw their own diagrams for their investigations. In later lessons, students will use previously constructed diagrams for their investigations. This method was chosen for the later lessons to save classroom instructional time.

One of the drawbacks to the TI-92 calculator is that it uses its internal memory to store saved sessions (TI-92 saves all sessions automatically). Therefore, after several weeks use, these saved sessions overload the internal memory of the TI-92 calculator. To prevent the overloading of the internal memory of the TI-92 calculator the student manual continuously requests students to delete previous geometry sessions. Also, the teacher notes suggest that you transfer the prepared diagrams (files) to the student calculators at three different intervals. It is important for you to follow these suggestions to prevent students receiving memory error messages on their calculators.

Report any serious difficulties with the TI-92 calculators to either Dr. Jamski at 941-2392 or Dr. Ryan at 941-2539.

TI-92 Calculator Set-up

Before introducing the TI-92 calculator to the class, it is necessary to check each TI-92 calculator for satisfactory operation. Complete the following steps to check each TI-92 calculator.

1. Turn on each TI-92 calculator (reference page 3).
2. If you cannot see anything on the screen of a calculator, you will need to adjust the screen display (reference section, Adjusting Screen Display, on page 3).
3. If you still cannot see anything on the screen of a calculator, then you will need to change the batteries of the calculator. To do this complete the following steps:
   a. Turn off the TI-92 calculator.
   b. Place the TI-92 calculator face down on a clean surface.
   c. Slide the latch on the top of the TI-92 to the right unlocked position.
   d. Slide the rear cover of the TI-92 down about one-eighth of an inch and remove the rear cover from the main unit of the TI-92.
   e. Remove all four AA batteries.
   f. Install new AA batteries. Make sure to use the polarity diagram located in the battery compartment to place the batteries in the right direction.
   g. Replace rear cover.
   h. Slide the latch on the top of the TI-92 calculator to the locked position.
   i. Turn on the TI-92 calculator, and adjust the screen display.
4. If after completing step 3 the TI-92 calculator still does not work, then contact me and describe the problem.
5. After adjusting the display of each calculator, you need to check the memory of each calculator and delete all unnecessary files. To do this complete the following steps:
   a. Turn on the TI-92 calculator.
   b. Press one of the **2nd** keys.
   c. Press the number **6** key.
   d. Press **F1**.
   e. Press the number **2**.
   f. Press one of the **ENTER** keys. This clears all saved sessions. The TI-92 calculator should now have no saved sessions.
6. To make sure that all students see the same screen when they turn on their TI-92 calculator, you need to clear the home screen. To do this, press **F1**, then the number **8**. This clears the home screen. Use the clear key to delete any entries in the operation line at the bottom of the home screen.
7. Finally, the classroom set of calculators needs to be numbered. Use tape to place numbers on each calculator.

Lesson 1 - Introduction to TI-92 Calculator

The purpose of the first lesson is to familiarize the students with the TI-92 calculator and its geometry applications. Anticipate many questions as the students get their first experience with the calculator. Before you give the students the calculators make sure that you have recorded the number of the calculator that each student receives.

Part 1 - Familiarization with TI-92 Calculator

This will be the first experience with the TI-92 calculator for most of the students. The purpose of this section is to make the students comfortable with the TI-92 keys. Note the following:

1. Use the overhead projector and illustrate for the students the function of the different keys. Proceed slowly and allow students to ask questions.
2. Make sure as you complete this section in class that all students learn how to adjust their screen displays. Have students adjust their screen displays even if the screen display on their calculator is OK. It is important for students to learn to *press and hold a key* (in this case the green diamond key) as the TI-92 calculator uses this approach for a number of calculator routines.
3. Reference **Backspace** key page 6. An alternate procedure to clear the operation at the bottom of the home screen is to press the **Clear** key. This clears the complete operation. You then need to retype the corrected operation. But remember it is more important for students to learn the backspace key as they will need to use this key frequently in the geometry sessions.

Approximate Time - 20 to 30 minutes

Part 2 - Introduction to Geometry Applications

This will be the first experience with the geometry application of the TI-92 calculator for most students. The purpose of this section is to give the students their initial experiences with the geometry application of the TI-92 calculator. Note the following:

1. Use the overhead projector and carefully guide the students through the procedure for starting a new geometry session and the procedures for drawing different geometry figures.
2. Make sure in each class to use a different name for the geometry session (reference step 6 page 8). Do not use common geometry terms for the name of the session as the calculator reserves many of these for calculator functions.
3. When guiding the students through the drawings on pages 9 to 12, have the students help you decide the most appropriate place to position the starting point of the drawing on the screen. The starting point is related to the type of geometry figure that you want to draw. Also emphasize that all drawings should be reasonable sizes. Some students have a tendency to draw very small diagrams.
4. The **Clearing Geometry Screen** section on page 9 is placed before the instructions for the different geometry drawings since you use this technique to clear the drawings. Thus, you use this technique to clear the geometry screen after the students have completed the drawing of the line segment and all other figures.
5. When drawing circles, you must press the **ENTER** key to define the circle. Some students will forget to do this and the circle will disappear from their calculator's screen.
6. In the regular polygon drawings (page 12) you increase the number of sides of the polygon by shortening the defining chord of the circle and decrease the number of sides of the

polygon by lengthening the defining chord of the circle You can get star designs from regular polygon drawings by dragging the defining chord of the circle to the opposite side of the circle (across its center).

7. When illustrating the comment box for the students (page 12 and 13) on the overhead projector, type at regular speed to show the students the problems with typing letters too quickly (the calculator will miss many of the letters). Emphasize with the students the need to type very slowly when making comments. Use the backspace key to delete mistakes.

8. The skill of Resizing Geometric Figures (page 14) is an essential skill. The students will use this procedure in many of the investigations.

9. Make sure that the students clear their geometry screens before beginning their designs. Have students share their designs with the class by connecting their calculators to the overhead. You can share the three designs on pages 15 and 16. They are called **fun1**, **fun2**, and **fun3** and are in the folder called **FUN**. The file **fun2** is animated.

Approximate Time: 30 to 40 minutes

Lesson 2 - File Management, and Labeling and Measuring Geometric Figures

The purpose of the second lesson is to create the student's folder and to introduce students to the labeling and measuring functions of the TI-92 calculator.

Part 1 - File Management

In this section, the students will create the folder for all their future work. Have students use their own names for the name of their folders.

Approximate Time - 5 minutes

Part 2 - Geometry Applications

The purpose of this section is to introduce the students to the labeling and measuring functions of the TI-92 calculator. Note the following:

1. Use the overhead projector and carefully guide the students through the procedures in this section.
2. Make sure that students understand how to set the precision of measurements in the geometry application of the TI-92 calculator (reference pages 20 and 21). The calculator default value is 2 and for most of the measurements the students will make with the calculator the measurement precision needs to be set to 1. This procedure should become automatic when the students are starting a new geometry session.
3. Remind students that the TI-92 calculator will always use centimeters for linear measurements.
4. When dragging labels or measurements on the TI-92 calculator sometimes it appears that the label or measurement is not moving. In these cases, if you continue to drag using the hand lock key and the cursor pad the label or measurement will eventually jump to the position of the screen cursor. This is awkward but there is no way around it. As students gain experience with dragging they will become more proficient with it.
5. Carefully show students the difference between measuring the lengths of the sides of a triangle (measuring the distance between the endpoints of the side) and finding the perimeter of the triangle (having the screen cursor touch one of the sides of the triangle).
6. Assign the problem on page 26 to students who need extra practice with labeling and measuring using the TI-92 calculator.

   Approximate Time: 45 to 55 minutes

It is now necessary to transfer files to the student calculators. You will transfer the files for lessons 2 to 5. Transfer the files **pent**, **pl2**, **pl3**, **pl4, pl5**, **prob3**, and **tri1** to the main folder of the student calculators before the next lesson. To do this, complete the following steps:

1. Use the TI-92 connecting cable to connect sending calculator (the calculator that already has the files **pent**, **pl2**, **pl3**, **pl4, pl5**, **prob3**, and **tri1**) and the receiving calculator.
2. Open the VAR-LINK screen on both calculators (the 2nd key and the minus key).
3. On the receiving calculator, press **F3** and **2:Receive**. Make sure to do this first.
4. On the sending calculator, checkmark the files **pent**, **pl2**, **pl3**, **pl4, pl5**, **prob3**, and **tri1**. Make sure that they are the only files that are checkmarked. Now, press **F3** and **1:Send**. Make sure to do this second.
5. If there is a loose connection, the files will not transfer. Redo the connections and try again.

Lesson 3 - File Management, and Labeling, Marking, and Measuring Angles

The purpose of this lesson is to introduce students to angles on the TI-92 calculator and completing tasks on their own using the TI-92 calculator.

Part 1 - Drawing, Labeling, Marking, Measuring, and Resizing an Angle

The purpose of this section is to introduce students to angle and angle measurements on the TI-92 calculator and to give the students their first experience with completing tasks on their own using the TI-92 calculator. If you wish you can pair the students for this section. Try to have students complete as much of this section on their own. Give help only when it is necessary. Note the following:

1. It is important to complete the measuring angle (page 28) using the overhead. This will demonstrate to the students that the measurements on the TI-92 calculator are accurate.
2. When resizing angle (page 29) the angle mark may jump to the opposite side of the angle. If this happens have the students drag the angle mark back to the correct side of the angle.

Approximate Time: 25 to 30 minutes

Part 2 - Copying a Geometry Session

The purpose of this section is to introduce students to the process of copying geometry sessions and then working with these prepared geometry diagrams. Try to have students complete as much of this section on their own. If you wish you can pair the students for this section. Give help only when it is necessary. Assign the problem on page 34 to students who need additional practice with marking and measuring angles.

Approximate Time: 25 to 30 minutes

Lesson 4 - File Management, Parallel Lines, and Regular Polygons

Part 1 - File Management

It is important for students to delete old geometry sessions from their folders. Old geometry sessions on the TI-92 calculator use the TI-92 memory. If too much memory is used for saving old sessions, then when you try to open a previous geometry session you will get a memory error message. To prevent this from happening, it is best to periodically delete old geometry sessions from the calculator. Make sure that students only delete geometry sessions from their own folders. Do not forget to also periodically delete old geometry sessions from the main folder.

Use the overhead projector to guide the students through this section.

Approximate Time: 5 to 10 minutes

Part 2 -Drawing and Testing Parallel Lines

This purpose of this section is to introduce to students the procedures for drawing lines, drawing parallel lines, placing points on intersecting lines, and to test whether two lines are parallel. The skill of testing whether two lines are parallel is not required for this geometry unit. Therefore, if you wish you may omit that part of this section. Have the students complete the procedures in this section on their own. If you wish you can pair the students for this section. Give help only when it is necessary. Note the following:

1. When drawing lines, you must press the **ENTER** key to define the line. Some students will forget to do this and the line will disappear from their calculator's screen.
2. Make sure that students use sufficient separation for their two parallel lines.

Approximate Time: 20 to 25 minutes

Part 3 - Investigations of the Properties of Regular Pentagons

The purpose of this section is to introduce students to the method of investigation that will be used in this supplementary manual. Have the students work in pairs to complete the investigations in this section. Give help only when it is necessary. Discuss student findings when students have completed the investigations. Students should discover that the five angles of a regular pentagon have the same measure and the five sides of a regular pentagon have the same length.

If you wish to give your students more experience with this type of investigation, then assign the problem on page 42.

Approximate Time: 25 to 30 minutes. Problem on page 42 will take an additional 25 to 30 minutes.

Lesson 5 - File Management and Review of TI-92 Geometry Application

The purpose of this section is to give students a chance to review the TI-92 procedures that they practiced in lessons 1 to 4.

Locking/Unlocking Geometry Sessions

The purpose of this section is to show how to lock sessions so that you do not accidentally delete the sessions. You may omit this section if you wish since we do not make use of this function in this supplementary unit. If you do complete this section, use the overhead projector to guide students through the procedure.

Approximate Time: 5 to 10 minutes

Review Problems

These problems will reinforce the skills students need for the future lessons. Assign at least problems 1, 2, and 3 on pages 44 and 45 . For problem 6, the midpoint tool is located at F4 #3. In problem 6, the resulting figure should be a triangle.

Approximate Time: depends on the problems assigned.

It is now necessary to delete the files **pent**, **pl2**, **pl3**, **pl4**, **pl5**, **prob3**, and **tri1** from the main folder of the student calculators. Have one of the students complete this task for you.

You will transfer the files for lessons 6 to 10 to the student calculators. Transfer the files **aiang1**, **aiang2** **Anglin1**, **Anglin2**, **coralt1**, **coralt2** **corang1**, **corang2**, **corang3**, **corang4**, **parpor**, **parpor1**, **rectpor**, **rectpor2**, **rhompor**, **rhompor1**, **rtpr1**, **rtpr2**, **rtpr3**, **rtpr4**, **rtpr5**, **trsum1**, **trsum2**, and **trsum3** to the main folder of the student calculators before the next lesson. To do this, review the steps on page 122.

Lesson 6 - Section 7.7 - Angles and Lines

The procedure in this lesson will the same procedure used for all other lessons. You need to decide the best way to integrate this lesson into section 7.7. Students will work in pairs to complete the investigations.

Part 1 - Linear Pairs

The purpose of this section is to develop the relationship between angles forming a linear pair. When students drag the ray to get additional angle measurements, it is possible that one of the angle marks may jump to the straight angle ABD. If this happens, have the student drag the angle mark to the correct angle.

Approximate Time: 15 to 20 minutes

Part 2 - Vertical Angles

The purpose of this section is to develop the relationship between vertical angles. When students drag the ray to get additional angle measurements, it is possible that one of the angle marks may jump to an adjacent angle from one of the vertical angles. If this happens, have the student drag the angle mark to the correct angle.

Approximate Time: 15 to 20 minutes

Part 3 - Perpendicular Lines

The purpose of this section is to help students visualize perpendicular lines in a variety of orientations.

Approximate Time: 10 to 15 minutes

Problems

Answers to problems on page 51:

#1. a = 144.3°
b = 35.7°
c = 144.3°

#2. x = 131.2°

Lesson 7 - Section 7-8 - Angles and Parallel Lines

In this lesson, the geometry diagrams have been drawn for the students. This should reduce the amount of time necessary for the investigations.

Part 1 - Corresponding Angles

The purpose of this section is to develop the relationship between corresponding angles. When students drag the transversal to get additional angle measurements, it is possible that one of the angle marks may jump to an adjacent angle from one of the corresponding angles. If this happens, have the student drag the angle mark to the correct angle. In order to reduce clutter on the diagrams, students use different diagrams for each of the four pairs of corresponding angles. If time is a problem, then you can have students complete less than the four investigations.

Approximate Time: 35 to 40 minutes

Part 2 - Alternate Interior Angles

The purpose of this section is to develop the relationship between alternate interior angles. When students drag the transversal to get additional angle measurements, it is possible that one of the angle marks may jump to an adjacent angle from one of the alternate interior angles. If this happens, have the student drag the angle mark to the correct angle. In order to reduce clutter on the diagrams, students use different diagrams for each of the two pairs of alternate interior angles.

Approximate Time: 20 to 25 minutes

Problems

Answers to problems on page 57:

#1 a = 45.8°
b = 134.2°
c = 45.8°
d = 134.2°
e = 134.2°
f = 45.8°
g = 134.2°

#2. a = 49.7°
b = 86.5°
c = 43.8°
d = 130.3°
e = 136.2°

Lesson 8 - Section 7-9 - Special Quadrilaterals

The different quadrilaterals used in this section for investigations were drawn using the parallel line, the perpendicular line, and the hide/show tools. It is **very important** for students to follow the directions exactly. If students drag vertices other than the ones indicated, the desired results will not be obtained. Thus, stress to the students to follow the directions exactly. It is possible that some students may press the hide/show tool (F7 #1) when completing some of the investigations in this section. If they do this, then the students will see the hidden lines (dotted) in the diagrams. In this case, have the student press the ESC key so that the dotted lines disappear from the screen.

Part 1 - Properties of a Parallelogram

The purpose of this section is to develop the relationship between the lengths of the opposite sides of a parallelogram, between the opposite angles of parallelogram, and between the adjacent angles of a parallelogram. The students use one copy of the diagram (file parpor) to investigate the relationship between the lengths of the opposite sides of a parallelogram and the second copy of the diagram (file parpor1) to investigate the relationship between the opposite angles of parallelogram and between the adjacent angles of a parallelogram. In steps 5 and 6, and steps 12 and 13 emphasize to the students to drag only vertices P and Q.

Approximate Time: 15 to 20 minutes

Part 2 - Properties of a Rhombus

The purpose of this section is to develop the relationship between the lengths of the sides of a rhombus, between the opposite angles of rhombus, and between the adjacent angles of a rhombus. The students use one copy of the diagram (file rhompor) to investigate the relationship between the lengths of the sides of a rhombus and the second copy of the diagram (file rhompor1) to investigate the relationship between the opposite angles of rhombus and between the adjacent angles of a rhombus. In steps 5 and 11 emphasize to the students to drag only vertex Y.

Approximate Time: 15 to 20 minutes

Part 3 - Properties of a Rectangle

The purpose of this section is to develop the relationship between the lengths of the opposite sides of a rectangle and between the angles of rectangle. The students use one copy of the diagram (file rectpor) to investigate the relationship between the lengths of the opposite sides of a rectangle and the second copy of the diagram (file rectpor2) to investigate the relationship between the angles of rectangle. In steps 5 and 6, and steps 12 and 13 emphasize to the students to drag only vertices A and B.

Approximate Time: 15 to 20 minutes

Part 4 - Properties of a Square

The purpose of this section is to develop the relationship between the lengths of the sides of a square and between the angles of square. The students will use the regular polygon tool to make a square (file sqpor). After labeling the square, the students will make a second copy of the square (file sqpor1). The students use the first copy of the square (file sqpor) to investigate the relationship between the lengths of the sides of a square and the second copy of the square (file sqpor1) to investigate the relationship between the angles of square. Since the squares were drawn using the regular polygon tool students will encounter no difficulties in steps 15 and 21 if they drag a vertex other than vertex G.

Approximate Time: 15 to 20 minutes

Lesson 9 - Section 7-8 - The Triangle Sum Property

There is a mistake on page 64. The geometry sessions to be deleted are parpor, parpor1, rhompor, rhompor1, rectpor, **rectpor2**, sqpor, and sqpor1.

The purpose of this lesson is to find the sum of the angles of a triangle. Make sure that students draw a large triangle for their investigation. Students can drag any of the three vertices in step 9.

Approximate Time: 25 to 30 minutes

Problems

Answers to problems on page 65:

#1. $m\angle BAC = 33.2°$

#2. $m\angle PRS = 137.2°$

#3. $m\angle BAC = 34.5°$
$m\angle DBC = 21.1°$
$m\angle BEA = 51.8°$
$m\angle BEC = 128.2°$
$m\angle CED = 51.8°$
$m\angle CDB = 37.5°$

Lesson 10 - Section 13-1 - Area of a Right Triangle

There is no student investigation in this lesson. There are 5 right triangle problems (problems 2 to 7) that you can assign for students to solve. In problems 6 and 7, I used the hide/show tool (F7 #1) to hide the answers to the problems. Students can use the hide/show tool to see the answer. You can assign problem #8 to students who finish the problems early. In the TI-92 investigative problem on page 67, students will have to draw a small triangle first and gradually increase the length of one of the legs. Students can increase the length of one of the legs by dragging the appropriate vertex in the correct direction.

Answers to problems on page 66:

#3 Area $\triangle ABC = 3.1\ cm^2$

#4 Area $\triangle PQR = 2.4\ cm^2$

#5 Length of YZ = 2.3 cm

#6 Area of quadrilateral ABDE is $4.0\ cm^2$

#7 Area of hexagon ABLCDN is $2.4\ cm^2$

Approximate Time: depends on problems assigned

It is now necessary to delete the files **aiang1**, **aiang2** **Anglin1**, **Anglin2**, **coralt1**, **coralt2** **corang1**, **corang2**, **corang3**, **corang4**, **parpor**, **parpor1**, **rectpor**, **rectpor2**, **rhompor**, **rhompor1**, **rtpr1**, **rtpr2**, **rtpr3**, **rtpr4**, **rtpr5**, **trsum1**, **trsum2**, and **trsum3** from the main folder of the student calculators. Have one of the students complete this task for you.

You will transfer the files for lessons 11 to 15 to the student calculators. Transfer the files **arpg1**, **arpg2**, **arpg3**, **artr1**, **artr2**, **artr3**, **cs1**, **cs2**, **cs3**, **pytth**, **ptpr1**, **ptpr2**, **ptpr3**, **py1**, **py2**, and **py3** to the main folder of the student calculators before the next lesson. To do this, review the steps on page 122.

Lesson 11 - Section 13-3 - The Pythagorean Theorem

The purpose of this lesson is to for the students to discover the Pythagorean relationship. The right triangle for this investigation was drawn using the perpendicular line tool. Therefore, when students drag vertex B in step 4 and vertex C in step 5, ∠ACB will remain a right angle. Students should not drag vertex C as this will case ∠ACB to change from a right angle. It is possible that some students may press the hide/show tool (F7 #1) when completing the investigation in this lesson. If they do this, then the students will see the hidden lines (dotted) in the diagram. In this case, have the student press the ESC key so that the dotted lines disappear from the screen.

Approximate Time: 25 to 30 minutes

Problems

Answers to problems on page 69:

#1. Length of side AB = 5.0 cm

#2. Length of side BC = 3.8 cm (note: The TI-92 calculator file diagram for this problem is different from the student supplementary manual diagram on page 100.)

#3. Length of diagonal PR = 4.9 cm

Lesson 12 - Section 13-4 - Area of Any Triangle

The purpose of this lesson is for the students to discover that a triangle has three bases and three altitudes, and any one of the sets of bases and altitudes can be used to determine the area of the triangle. In this lesson, students draw and label a triangle and then make two copies of the triangle diagram. Students use triangle diagram file 1 (trhe) to calculate the area of $\triangle ABC$ using side BC as the base and AD as the altitude. Students use triangle diagram file 2 (trhe1) to calculate the area of $\triangle ABC$ using side AC as the base and BE as the altitude. Students use triangle diagram file 3 (trhe2) to calculate the area of $\triangle ABC$ using side AB as the base and CF as the altitude. Students may have to extend a side of $\triangle ABC$ to meet its corresponding altitude. The instructions for this are included in step 9.

Approximate Time: 45 to 50 minutes

Problems

Answers to problems on page 72 :

#1. Area of $\triangle DEF = 3.1\ cm^2$

#2. Length of height SR = 4.8 cm

#3. Area of quadrilateral STUV = $6.0\ cm^2$

Lesson 13 - Section 13-6 - Areas of Polygons

There is no student investigation in this lesson. There are 3 area of polygon problems that you can assign for students to solve.

Answers to problems on page 73:

#1. Area of quadrilateral ABCD = 3.8 cm^2

#2. Area of hexagon KLMNPQ = 6.8 cm^2

#3. Area of trapezoid EFGH = 3.6 cm^2

Approximate Time: depends on problems assigned

Lesson 14 - Section 13-6 - The Number Π

The purpose of this lesson is for students to discover an approximation for the value for Π. Students should draw a small circle first and then drag to enlarge the circle. Students use the comment box to place the values for the radius and circumference in suitable locations on the calculator screen. The values for the radius and circumference will change as the circle is enlarged or reduced.

Approximate Time: 25 to 30 minutes

Problems

Answers to problems on pages 75 and 76:

#1. Length of diameter AB = 2.8 cm

#2. Circumference of circle = 5.6 cm

#3 Length of line segment AC = 2.0 cm

Lesson 15 - Section 13-7 - Circles and Sectors

There is no student investigation in this lesson. There are 3 area of circle problems that you can assign for students to solve.

Answers to problems on page 77:

#1. Area of circle = 6.9 cm^2 (Students will obtain a value of 7.1 cm^2 in their calculations. This happens because of rounding.)

#2. Area of circle = 4.9 cm^2

#3. Area of circle = 2.2 cm^2

Approximate Time: depends on problems assigned